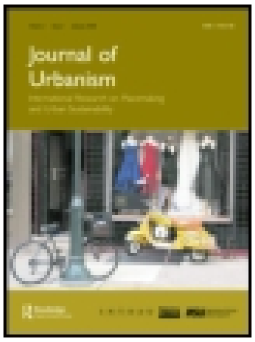

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The rise and fall of the American pedestrian mall

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ABSTRACT

This research provides a historical analysis of the American experiment with pedestrian malls. Specifically, we ask why some pedestrian malls have failed and were reopened to vehicular traffic while others have succeeded. Over 120 post-war malls from across the United States are statistically analysed, examining the relationship between the mall's lifespan and a variety of geographic, demographic, and economic factors. Using a Cox proportional hazard model, we find that cities' population density, the median age of the residents, the percent of the population that is white, proximity to beach, whether or not the City is a tourism destination, length of the mall, and the percent of sunny days are all significant in explaining a pedestrian mall's longevity. In addition, we also examine qualitative, design-based characteristics in order to better understand why certain pedestrian malls, despite their locational disadvantages, have thrived to the present day.

KEYWORDS

Pedestrian malls; walkability; downtown; urbanism

Introduction

The American pedestrian mall, rarely seen these days, has a long lineage and perhaps improbably, a brighter future. Originally introduced from European cities in the post-war period, pedestrian malls were conceived as a means to address the urban crisis in US cities of the 1960s and 1970s. Many of these malls failed and were removed; however, a few survive to this day and serve as models for a new generation of pedestrian malls. What can we learn from this urban experiment that ostensibly appears to have failed? What important lessons can this first generation of malls help us to understand why certain malls failed and others to succeed? This research provides an empirically driven historical analysis to explain why some US pedestrian malls have failed while others have succeeded, and to identify best practices for current mall implementation. Over 120 post-war malls from across the United States are statistically analysed, examining the relationship between the mall's lifespan and a variety of geographic, demographic, and economic factors, helping to explain why the majority of post-war malls were eventually reopened to vehicular traffic. Understanding past failures can help city planners, public officials and pedestrian advocates better plan for an implement the next generation of pedestrian malls. In addition, we also examine qualitative, design-based characteristics in order to better understand why certain, pedestrian malls, despite their locational disadvantages, have thrived to the present day.

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Historical context

One of the earliest known examples of a modern mall occurred in Essen, Germany, when a street was converted from a vehicular pathway to a pedestrian mall in 1926 (Rubenstein 1992). However, it was not until the post-war period that the pedestrian mall was more comprehensively incorporated into the urban planning and design of European cities. Immediately after World War II, many European cities rebuilt their devastated cities – mostly out of necessity – to prioritize vehicular access. However, after a few cautious experiments with pedestrianization in the 1950s, city planners and public officials began embracing the pedestrian mall, reflecting evolving public attitudes toward the environment and quality of life considerations, but also to enhance mobility and create public spaces in congested medieval street patterns that could no longer accommodate vehicular traffic (Gehl and Gemzøe 2004). Public officials started experimenting with closing off narrow streets to traffic, eventually leading to widespread street closings in city centers (Robertson 1994), and over time, a pedestrian network began to emerge. The pedestrianization of Strøget (Copenhagen), beginning in 1962, is generally seen as the first extensive pedestrian malls in Europe. According to Rubenstein (1992), by 1966, West Germany was home to over 60 pedestrian malls, focused mostly in Cologne, Kassal, and Kiel. By 1973 West Germany had 214 malls, which quickly grew to 340 by 1977, and 800 by 1990.

Borrowing from these European examples, US cities began introducing and experimenting with pedestrian malls in the 1960s and 1970s. Unlike their European counterparts, however, these interventions were a means to address the urban crisis of the time and often had a specific and somewhat more narrow economic development focus. In fact, they rarely referenced or replicated actual European precedents (Gregg 2019). Instead, city officials and planners hoped to stem the tide of white flight, urban decline and depopulation, and the fleeing of business and commercial activity to the suburbs by adopting the pedestrian mall as a means to revitalize downtowns (Rubenstein 1992). This had the effect of prioritizing the role of the department store in downtown revitalization (Cohen 2007), the idea being that pedestrian malls could leverage the popularity of post-war suburban shopping by mimicking their layout and design. Consequently, many design elements used in pedestrian malls of the time were intentional imitations of shopping malls, such as the use of fountains and a defined sense of enclosure (Pojani 2010). Both shopping and pedestrian mall designers believed that designing a space separated from the congestion of the city would prompt shoppers to spend more time shopping, exploring, and socializing downtown.

Following the popular acceptance of pedestrian malls, official governmental support soon followed by means of amending the tax laws, zoning ordinances, funding opportunities, and legislation. Business owners along pedestrian malls willingly paid higher taxes to maintain the mall (Pojani 2010), as being located on a pedestrian mall was understood to increase sales. Many pedestrian mall improvements were funded through bonus zoning which traded added development rights in exchange for the construction of desirable pedestrian improvements. Urban renewal funding was made available through the federal government for pedestrian malls in downtown areas, and several national organizations created funding specifically for the construction of pedestrian malls. Although the most visible federal projects were in larger cities, smaller cities received the majority of urban renewal funding (Amos 2019). Some states updated their legislation to accommodate pedestrian malls; California adopted the Pedestrian Mall Law in 1960 which declared "certain areas in cities [. . .] need to separate pedestrian travel [. . .] which can be accomplished by the establishment of pedestrian malls" (Pojani 2010).

Nevertheless, by the 1980s, it had become clear that pedestrian malls often produced disappointing results. There were a myriad of reasons for this. Compared with their European counterparts, pedestrian malls in the US did not benefit from regional level planning which could limit the amount of suburban retail and commercial spaces developed, and as such many pedestrian malls were outcompeted by suburban counterparts that offered ample-free parking and a climate-controlled environment. Similarly, declining residential and office populations in the central cities meant that there were insufficient shoppers and pedestrians to utilize the malls. Without a continuous, steady flow of pedestrians; either from residents, employees, or shoppers, pedestrian malls become desolate and businesses suffered (Judge 2013). Storefront vacancies along pedestrian malls were often higher than neighboring commercial arterials. This in turn had additional negative consequences: the lack of pedestrians increased public perception of higher crime (and sometimes actual higher crime rates), which then led to fewer pedestrians using the space and declining incentives for residents to spend time downtown. Instead of attracting users, pedestrian malls increasingly frightened them away. Parajuli and Pojani (2018) examine efforts to pedestrianize urban centers in Brisbane, Australia, and Kathmandu, Nepal. Despite the very different circumstances, both cities face similar barriers to pedestrianization, including opposition from residents, motorists, and local merchants; poor management of alternative transport and parking enforcement; and a lack of institutional and political support. Pedestrian malls in the US faced a similar situation.

Additionally, many malls of the time were designed without reference to an appropriate scale, resulting in streets which were too wide, buildings too tall, and spaces which made pedestrians feel uncomfortable. Planners often failed to constrain the length of the malls, resulting in long, redundant pedestrian streets with no visual or physical barriers to break up the space. Retailers along these excessively long malls found customers were unwilling to transport goods that far on foot and increasingly preferred to shop elsewhere (Robertson 1994).

Federal funding for urban renewal was discontinued in 1974, and by the 1980s, planners abandoned pedestrian malls as an urban design intervention and increasingly favoured other, more strategic methods of downtown redevelopment, such as the festival marketplaces which were often the result of private–public partnerships (Amos 2019). Malls already built were either tolerated (often leading to neglect or deterioration) with minimal maintenance, investment, or use; or they were reopened to traffic. Historically successful malls in upstate New York, Chicago, Minneapolis, Baltimore, and Philadelphia (plus many more) now allow vehicles. Today, very few of the original generation of pedestrian malls remain.

However, in the last decade or so, the pedestrian mall has witnessed a revival of sorts. In the words of a 2009 *New York Times* article, "The pedestrian mall, the urban planner's failed attempt to revitalize Main Streets during the 1960's and 70s, is back"! (New York Times, 2009). The redevelopment of Santa Monica's pedestrian mall highlights the continuing interest in the use of this design intervention (Pojani, 2008). This should not be particularly surprising, as public attitudes toward urban living have shifted in the intervening years. Furthermore, many of the conditions present in our cities during the first attempt to introduce the pedestrian mall are less relevant today or have disappeared entirely: central cities have seen population growth and investment, and are increasingly concerned about gentrification rather than disinvestment, and crime rates in larger cities have fallen dramatically since the 1980s. These changing urban fortunes reflect generational differences, policy intervention, changing technology, and evolving societal consumption patterns. It is not unreasonable to assume that the time has perhaps come for the rebirth of the pedestrian mall. As such, it is important to look back and learn from an earlier generation of the pedestrian mall in terms of their successes and failures.

Understanding why some pedestrian malls succeeded

What explains why some of these earlier pedestrian malls succeeded while others failed? The relevant research has suggested a range of both locational or contextual factors, which relate to the environmental, geographic, and socioeconomic context of the pedestrian mall, as well as site-specific physical and design factors of the pedestrian mall itself contribute to the long-term viability of the pedestrian mall. We will examine both of these explanations.

Locational factors include a number of demographic or geographic indicators whose presence, absence, or proximity can help explain whether or not a pedestrian mall succeeds. One factor commonly cited is the proximity of the mall to a university or college, and the continuing presence of pedestrian malls in college towns such as Boulder, Colorado (University of Colorado) and Burlington, Vermont (University of Vermont) and Ithaca, NY (Cornell University and Ithaca College) are often cited as evidence (Judge 2013; Robertson 1994; Pojani 2010; Amos 2019). This is a not unreasonable relationship, as the presence of a College or University provides a very localized source of pedestrian traffic. Unsurprisingly, a younger population is often associated with greater pedestrian mall usage (Judge 2013), usually referring to college-age students, but also an acknowledgement of the mobility of residents. Fussell (1974) suggests that most malls do not design with mobility in mind, and therefore older communities are less likely to use a mall. There also appears to be an inverse relationship between successful pedestrian malls and local population size, and surviving malls tend to be located in small to medium-sized cities (Pojani 2010), as these places tend to have less complicated and less congested downtown traffic patterns and are therefore more amenable to the pedestrian mall. As evidence, some have pointed to statistics that show that approximately 80% of successful pedestrian malls are located in cities with population sunder 100,000 (Judge 2013). On a similar note, metropolitan areas with lower density and more auto-oriented development are not conducive to pedestrian malls, as they often to compete with more accessible suburban retail locations. We would therefore expect that cities that are more sprawling in terms of their urban form are less likely to support successful pedestrian malls. In addition, being near a tourist attraction has also been identified with pedestrian mall success, as a dedicated tourism base can boost pedestrian mall usage (Robertson 1994; Judge 2013). Specifically, proximity to a beach is often cited as a key success indicator. Judge (2013) notes pedestrian malls in Miami Beach, Santa Monica, Newport News, New Bedford, and Newburyport as examples. On a similar note (and perhaps most obviously), the weather is often cited as integral to a pedestrian mall success (Rubenstein 1992; Robertson 1994; Amos 2019), and the need for adequate seating, shading, and outdoor activities to take advantage of fair weather (Rubenstein 1992). Finally, relative wealth and pedestrian mall success are also discussed; in particular, the ability of high-income areas to support economic activity along the mall (Robertson 1994). We also include the percent of the community's population that is white to control for independent effects of race.

In addition to these, a range of design and site-specific characteristics also impact the extent to which pedestrian malls can be successful. Although detailed analyses of pedestrian mall design are not readily available, a number of studies have articulated the relationship between urban design and the amount and degree of pedestrian activity in public spaces (see Hooi and Pojani (2019) for a comprehensive overview of this literature). For the most part, this research is generally descriptive and derived from observations. A number of other studies have examined the role of design and the built environment in fostering viable Main Street commercial cores. Hooi and Pojani (2019) examine the relationship between design quality and walkability. Borrowing an analytical framework from Ewing and Bartholomew (2013), they analyse suburban High Streets in Brisbane, Australia using a range of qualities including imageability, enclosure, scale, transparency, and complexity that contribute to overall street quality. Similarly, Talen and Jeong (2019) identify a number of variables to capture the success of main streets using the city of Chicago. They identify eight variables that are categorized into service, opportunity, and quality which contribute to the liveability and vitality of an American main street. We will draw on these studies to examine the qualitative aspects of pedestrian mall success.

Research design

To understand why some malls succeed and others fail, this research uses a multiple method approach to identify conditions and characteristics which impact a pedestrian mall's success (interpreted as the mall's longevity). First, we utilize relevant demographic, locational, environmental, and socioeconomic factors discussed earlier, that impact whether or not a pedestrian mall is successful or not. Although some of these may appear intuitive, a robust statistical analysis of these causal factors is lacking. The following is a list of locational factors included in the statistical analysis:

In addition, we examine a range of site-specific characteristics of malls, based on our review of the literature on the relationship between design and vitality. These characteristics include a sense of containment, the presence of ground floor transparency, shading, seating, vegetation paving, and lighting in order to better understand qualitative factors correlated with pedestrian mall lifespan. To this end, we conduct a series of case studies to analyse site-specific factors. In order to identify the specific cases, pedestrian malls are selected that have survived but should *not* have according to the statistical results.

Data

A number of historical catalogues of US-based pedestrian malls exist (Brambilla and Longo 1977; Rubenstein 1978; Onibokun 1975; Judge 2013); however, the most update to date and relevant for our analysis is that compiled by Amos (2019), which was published while this work was under consideration. Amos (2019) reviewed both historical documents as well as satellite imagery, online sources, and outreach to identify 140 pedestrian malls (94 of which have been removed and 46 still existing) built between 1959 and 1985. Although our analysis covers similar terrain, these studies are largely descriptive in nature and do not provide statistical analysis or interpretation.

Building on these studies, and based on data from Google Maps, historic photographs, newspaper articles, scholarly articles, and city officials, we compiled a dataset of 125 pedestrian malls, including their year of origin, year of removal, and block length.[1] A number of malls included in Amos (2019) were removed due to a lack of demographic, locational, environmental, and socioeconomic information (Table 1) that we assume to be associated with the lifespan of pedestrian malls for the statistical analysis and interpretation.

The locational and environmental factors such as the proximity to a beach, the presence of a university, and whether the municipality is a tourist destination were collected from multiple official sources and double-checked through Google map. We collected the demographic and socioeconomic data such as population, race, age, and family income from the Decennial Surveys and American Community Surveys (ACS) published by the US Census Bureau. These factors change constantly during the lifespan of a mall and therefore introduce additional temporal variation. In order to account for both temporal and cross-sectional variations, we collected these time-varying factors for multiple years during the malls' lifespan. Therefore, instead of recording one mall at a single time point, the final dataset splits one observation into multiple time periods.

Table 1. Description of variables.

Variable	Source	Operational definition	Expected relationship with Mall Age
Pedestrian Mall Age	City officials, Google Map, historic photographs, newspaper articles, scholarly articles	Years pedestrian mall was closed to vehicular traffic	N/A
Presence of University	Google Maps, University websites	1 if total enrollment in higher education within five miles > 15,000 0 if total enrollment in higher education within five miles < 15,000	+
Population	U.S. Decennial Census, ACS 5-Year Estimates	Log(Total number of residents living in city)	-
Population Density	US Decennial Census, ACS 5-Year Estimates	Log(Population/Total land area of city)	+
Median residential age	US Decennial Census, ACS 5-Year Estimates	Median age of city residents	-
Race	US Decennial Census, ACS 5-Year Estimates	Percent population white	
Length of Pedestrian Mall	Google Maps, Google earth historical imagery	Log(Length of mall in feet)	-
Presence of Beach	Google Maps	1 if beach within one mile of mall 0 if no beach within one mile of mall	+
Tourism	US National Tourism Office	1 if one of the 20 top US tourist cities 0 if not	+
Weather	National Weather Service	Percent sunny days annual	+

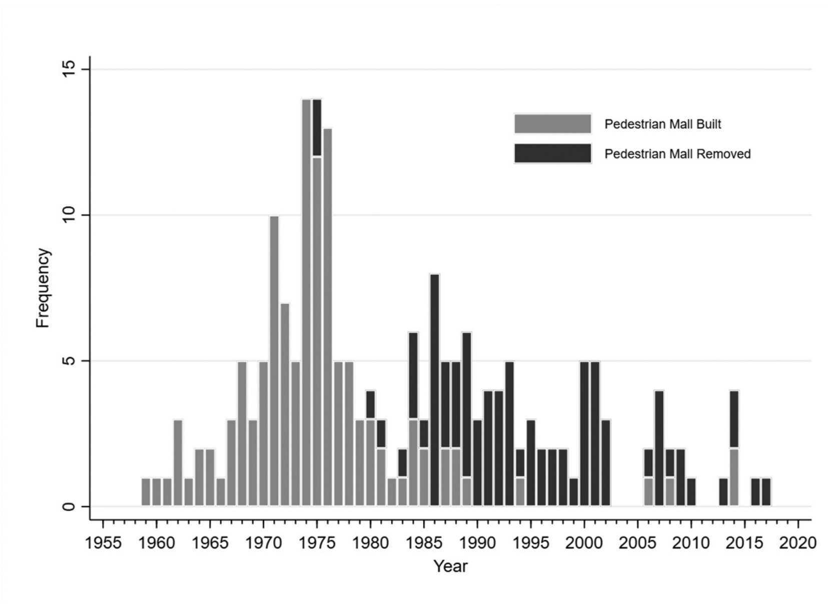

Figure 1. US pedestrian malls, year built and removed.

Figure 1 presents a graphical summary of our dataset; 43 pedestrian malls still exist in 2019, while 82 have either been removed or reopened to traffic. Pedestrian malls were first introduced in the late 1950s, but it was not until the 1970s that their numbers dramatically increased. The 1980s saw declining numbers of malls introduced and an increasing number removed. It is only in the last 15 years or so that new malls have been introduced. Of those malls that have closed, the minimum mall lifespan is 4 years, the maximum is 52 years, and the average is 27.7 years. The length of the malls varies between 5 and 8 blocks.

Methods

As many of the pedestrian malls have not yet closed, ordinary linear regression is not an appropriate functional model form, as it cannot effectively handle the censoring of observations. Instead, a survival analysis method is used, which incorporates information from both censored and uncensored observations in estimating important model parameters. Often used in the medical field, survival analysis provides hazard ratios for many variables and can handle a dependent variable (such as age) that is not at its final value. An example would be analyzing the impact of chemotherapy on cancer patients. In this case, some patients may die during the study, giving a final age value. Other patients may survive, meaning their "age" value is a minimum of what the final value could be. This method is applicable to pedestrian mall analysis, as some have been closed and reopened to vehicular traffic and others still currently exist. The dependent variable in our survival analysis is composed of two parts: one is the time to the event, in this case, the closing of a mall (Survival function) and the other is the event status (hazard function), which records if the event of interest occurred or not. As many of the malls have not yet closed, their "survival" time is considered to be at least as long as the duration of the study (i.e. uncensored), something which would bias the results of ordinary linear regression. Using this technique, the age of the mall can be correlated with the hazards of many independent variables.

Many methods of hazard ratio analysis exist, but since this research uses a number of independent variables, a Cox Proportional Hazard Model is most appropriate as it simultaneously evaluates the effect of several covariates on survival without making restrictive assumptions concerning the nature of the underlying survival distribution. While a nonlinear relationship between the hazard function and the predictors is assumed, the hazard ratio comparing any two observations is in fact constant over time, indicating the impacts of predictors on the hazard ratio do not vary over time. The Proportional Hazards model handles multiple binary and continuous variables and accounts for the age variable bias. To indicate which pedestrian malls still exist (thereby biasing the age variable), it is censored by adding a binary variable (1 when biased, 0 if not). Data points that are censored are then handled as a minimum value in the hazard analysis. This analysis will produce a hazard ratio for each independent variable, signifying how much more hazardous a variable becomes with a one-unit increase.[2]

The next step in survival analysis is creating Kaplan–Meier curves, a method widely used to estimate and graph survival probabilities as a function of time. The method can be used to obtain univariate descriptive statistics for survival data, including the median survival time, and compare the survival experience for two or more groups of subjects. To create these tests, each variable needs to categorical so they could be compared. To create such categories, median values were used as cut off points for each variable, as illustrated in Table 2

These curves show the survival rate as time increases between categories of each independent variable. As a first step, this helps identify strong relationships between independent and dependent variables, as well as variables with weak differences between

Table 2. Categorical variables for Kaplan–Meier curves.

Variable	Category	Categorical value
University	Total enrollment in higher education within five miles < 15,000	0
	Total enrollment in higher education within five miles > 15,000	1
Population	Log(Population) < 11.245	0
	Log(Population) > 11.245	1
Population Density	Log(Pop Density) < 7.948	0
	Log(Pop Density) > 7.948	1
Median Age	Median age < 35.6	0
	Median age > 35.6	1
Race	% White < 70	0
	% White > 70	1
Length	Log(Length) < 6.824	0
	Log(Length) > 6.824	1
Beach	Beach not within 1 mile	0
	Beach within 1 mile	1
Tourism	Not one of the top 25 tourist cities	0
	One of the top 25 tourist cities	1
Income	Log(Median Family Income) < 11.025	0
	Log(Median Family Income) > 11.025	1
Sunny	% Sunny days < 55%	0
	% Sunny days > 55%	1

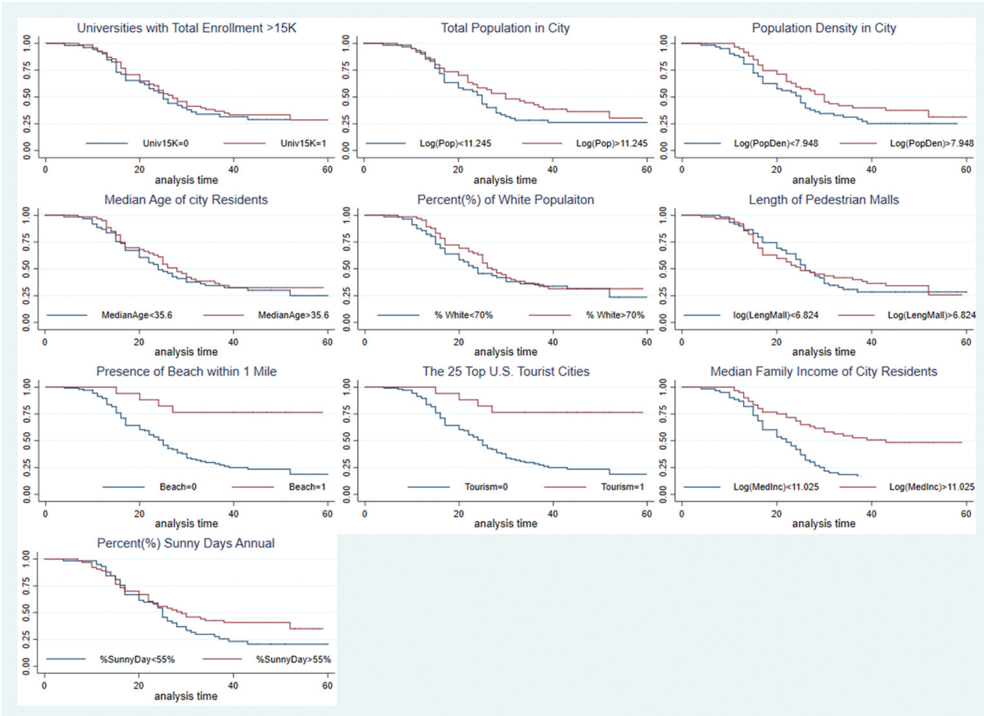

Figure 2. Kaplan–Meier Curves.

variables. While not suggesting statistical significance, they are helpful in identifying relationships.

See Figure 2 for results. The curves for the variables University, Median Age, Race, and Length show similar survival rates between categories, suggesting there is not a strong correlation between that independent variable and pedestrian mall age when not controlling for other variables. Curves for variables Population, Population Density, Median Family Income, and Percent of Sunny Days show a moderate differentiation between categories, suggesting that the variable impacts age significantly when uncontrolled. Curves for variables Beach and Tourism are most obviously differentiated, with survival rates varying greatly depending on the group. These variables are likely to be strongly correlated with the impact on pedestrian mall age.

Despite the interesting results from the Kaplan–Meier curve, it is ultimately a univariate analysis that describes the survival ratio according to one factor under investigation, meaning it fails to consider other factors simultaneously and is highly likely to introduce omitted variable bias. Furthermore, continuous variables have to be transformed into categorical form for the Kaplan–Meier curve analysis, limiting the interpretation. For a more robust statistical analysis, we utilize a Cox Proportional Hazard Model which provides better coefficient estimates.

Table 3 shows the results of the Cox Proportional Hazard Model. In addition to the assumed exploratory variables, we include Built Year (the year the mall was built) as a control variable to capture the unobservable time-related variance. The results of the regression analysis provide a hazard ratio for each independent variable. The hazard ratio

Table 3. Results of the Cox Proportional Hazard Model.

Variable	Haz. Ratio	Std. Error	Z value	P-value	95% CI
Presence of a University	0.927	0.254	−0.28	0.782	0.542–1.586
Log(Population)	0.928	0.138	−0.50	0.617	0.693–1.243
Log(Population Density)	0.660	0.134	−2.05	0.040**	0.444–0.982
Median Age of Residents	1.084	0.0321	2.72	0.007**	1.023–1.149
% Population White	0.947	0.009	−5.87	0.000***	0.930–0.964
Log(Length of Mall)	1.510	0.265	2.51	0.012**	1.100–2.158
Proximity to Beach	0.230	0.124	−2.73	0.006***	0.080–0.661
Tourism	0.048	0.032	−4.48	0.000***	0.013–0.180
Log(Median Family Income)	0.658	0.424	0.65	0.517	0.186–2.329
% Sunny Days Annually	0.961	0.014	−2.74	0.006***	0.934–0.989
Built Year	1.022	0.021	1.07	0.286	0.982–1.063
Number of Observations			472		
Log Likelihood = −438.250					
LR chi2 (11) = 79.62					

***p < 0.01 **p < 0.05 *p < 0.1

reflects the multiplicative effect on the hazard of a pedestrian mall closing associated with a one-unit increase in the independent variable. A hazard ratio of 1 means that changes in the independent variable do not impact the dependent variable.

Analysis

According to the model, cities' population density, the median age of the residents, the percent of the population that is white, the length of the mall, presence of beach, whether or not the city is a tourism destination, and the annual percent of sunny days are all significant in explaining a pedestrian mall's longevity.

The inclusion of population density is useful to examine the relationship between urban sprawl and pedestrian malls; the idea being that more sprawling locations have a harder time supporting pedestrian-oriented retail specifically, and economically vibrant central cities more broadly, as they are in competition with auto-oriented retail in suburban locations. The significance of population density in our model suggests that a pedestrian mall in a higher density (i.e. less sprawling) city is more likely to survive. Moreover, the model found that the hazard ratio of population density was 0.660, meaning that a unit increase in the log of population density decreases the risk of closure by 34%, as compared with the previous unit. For example, the risk of closure of a pedestrian mall with population density = 2 is 34% lesser than a mall with Population density = 1. However, we do not want to over-interpret this variable, as it does not truly capture regional sprawl or suburban competition to the pedestrian mall.

On the other hand, the population variable is insignificant, in contradiction to the existing literature which suggests that successful malls tend to be in small to medium-sized cities (Pojani 2010; Judge 2013). This is an unexpected result and could be due to the recent revival of pedestrian malls in larger cities as identified by the *New York Times* article (Pedestrian Malls: Back to the Future 2009). Our dataset also supports this, as close to 70% of the pedestrian malls built after 1985 are located in cities with a population greater than 10,0000, and 70% of these are still open in 2019. This recent trend is not captured in either Pojani (2010) or Amos (2019) as they only account for the malls built prior to 1990.

As the median age of residents increases, pedestrian malls are more likely to close. The hazard ratio of median age was found to be 1.084, with a 95% confidence interval of 1.023–1.149. The hazard ratio of 1.084 means that a one-unit increase in the log of the median age increases the risk of mall closure by 8.4% as compared to the previous unit. For example, a pedestrian mall in a city where the median age is 30 is 8.4% more likely to close than a mall in a city where the median age is 29. This corroborates the argument that the success of a pedestrian mall is often attributed to a college-age population (Judge 2013).

As the percentage of white residents increases, pedestrian malls are less likely to close. The hazard ratio of the percentage of the population that is white was found to be 0.947 with a confidence interval of 0.93–0.964. The hazard ratio of 0.947 means that when the white population increases by 1%, the risk of closure is 94.7% of the previous unit. For example, a pedestrian mall with White = 90% has 0.947 times the hazard of closure as White = 89%. This is a somewhat unexpected result, but could reflect lifestyle choices or be due to the historical circumstance of the first generation of pedestrian malls being located in more homogeneous communities. As urban areas continue to diversify, we would expect this variable to become less relevant.

The length of a pedestrian mall is negatively correlated to lifespan, implying that longer mall tends to suffer from a higher risk of closure and close sooner compared with shorter length malls. According to the model, a unit increase in the log (length of the mall) could give rise to 51% higher risk of closure as compared to the length of a shorter (by a unit) mall. This negative correlation between length of the mall and its lifespan is discussed by Judge (2013) who suggests that the most successful malls range from 1 to 4 blocks in length.

The proximity to a beach is identified as a key success indicator by Judge (2013). The significance of the beach variable in the Cox Model regression provides empirical evidence to this effect and quantifies that a mall close to a beach is 77% more likely to survive compared with a mall without a beach nearby.

Being in a city that is a major tourist destination also increases the chances of a pedestrian mall staying open. The Tourism variable had a hazard ratio of 0.048. It means that a pedestrian mall in a major tourist destination has 4.8% of the hazard of closure as a mall not in a tourist destination. This supports the argument proposed by Robertson (1994) and Judge (2013) that being a major tourist attraction contribute to the success of pedestrian malls.

Unsurprisingly, as the percentage of sunny days increases, the chances of a mall closing decrease. The Sunny variable was found to have a hazard ratio of.96, with a confidence interval of 0.934–0.989. The 0.96 value means that a pedestrian mall with 50% sunny days has 94% of the hazard of the closure of a mall with 49% sunny days.

Lessons from outliers

The results of the survival model analysis are instructive, but also unsatisfying. In the first place, planners and local government officials generally have little to no control over many of the statistically significant variables, such as the weather. This does not leave much room for a possible policy or design interventions to improve a pedestrian malls' success. In addition, there are likely many factors linked to pedestrian mall success that cannot be quantified due to qualitative properties or lack of data, including design elements, lighting, and vegetation. These, in turn, are factors that local officials and advocates have a degree of greater control over. Since these types of variables cannot be included in the statistical model, another methodology was needed. By identifying outliers – malls that are successful but should not be according to the model – the role and effect of some of these qualitative variables can be examined.

To identify outliers, those malls which are successful (that is, they currently still exist) but whose cities do not conform to the model results (i.e. lower population density, relatively low percent white, cloudier weather, not a tourist destination, an older demographic, etc.) were identified. Although an admittedly subjective classification, we used these definitions to identify five outliers including Downtown Crossing in Boston, MA, Occidental Mall in Seattle, WA., Jay Street Pedestrian Walkway in Schenectady, NY, and Peace Plaza in Rochester, MN. (please note that the outliers were chosen because they conformed to most, though not necessarily all of the criteria). In order to identify design and physical features, we rely on previous analyses of pedestrian malls and the literature on urban design and the built environment more broadly. These have highlighted a number of different design and physical characteristics essential to a successful pedestrian mall: a sense of containment, ground floor transparency, weather protection, appropriate and sufficient seating, vegetation, adequate lighting, and paving patterns. We examine each of our cases in light of these characteristics.

Sense of containment

Creating a sense of containment through appropriate street width and building height is important to enhance the pedestrian scale and augment a sense of protection and security (Talen and Jeong 2019; Hooi and Pojani 2019) All five case studies have a majority of building heights of three or more stories, which effectively blocks nearby structures, trees, traffic signals, and ground-level noise. Although Savannah and Schenectady do have a relatively large proportion of one and two-story structures, they are interspersed with three or more stories. Almost all the corner buildings of these malls are three or more stories, suggesting the entry/exit experience should have a greater sense of containment. During site visits, many of the shorter structures were blocked by tall trees, ensuring a sense of containment with mature trees instead of building height.

Ground floor transparency

Ground floor transparency and adequate window coverage are important to enhance the human scale and add visual interest (Rubenstein 1992; Robertson 1994; Hooi and Pojani 2019). For the case study analysis, the building façade transparency was defined as the percentage of the ground floor which was transparent. Transparent facades allow for window-shopping, variety of visual stimuli by shop and season, and adds depth to the mall periphery. An overwhelming majority of the ground floor facades had greater than 60% transparency. Only a few locations had transparency of less than 50%, but these tended to have greater vertical transparency. The amount of transparency, and therefore visual interest, in these malls, is likely contributing to their success. As pedestrians walk the mall, their sense of depth is increased, their eye is drawn along the mall by window displays, and seasonal changes in these displays create an evolving experience of the mall.

Protection from elements

Providing shelter and ensuring pedestrians are protected from adverse weather is a key design for a successful pedestrian mall (Whyte 1980; Mehta 2013). Weather protection can come from deciduous trees in the summer months, some coniferous trees in the winter months, and manmade structures year-round. In areas with varying weather conditions, we expect successful pedestrian malls to have extensive coverage through some overhead structure. The analysis revealed that locations with more adverse weather, in particular Rochester and Savannah, utilize opposite approaches to weather protection. The Rochester mall uses very few overhangs, which likely makes the space uncomfortable during much of the year. The mall also lacks any overhead trees, contributing to a sense of exposure and lack of comfort for the pedestrian. The Savannah City Market took the opposite approach, providing awnings at almost every building and filling the mall with large deciduous trees. In the summer almost the entire mall is shaded, creating a welcoming atmosphere and place of refuge for pedestrians.

Seating and vegetation

Successful malls should provide adequate seating, as well as varied plantings along the length of the mall (Whyte 1980; Rubenstein 1992; Jacobs 1993; Ewing and Bartholomew 2013). Seating extends the time pedestrians will spend at the mall, provides resting points for visitors, and visually breaks up the horizontal space. Vegetation can also break up visual space, provide shade, visual interest, and color along the mall. The case study analysis revealed a large variety of approaches to seating and vegetation. Schenectady offers virtually no seating and minimal plantings, while Savannah utilizes most of the open space for seating and includes a variety of planters. During site visits, it was clear that the malls that provided seating were more utilized. Savannah had a large number of pedestrians sitting, shopping, and eating on the mall while Seattle only had a few pedestrians walking through. Both Boston and Savannah placed planters in a way to break up visual space, which provided a much more interesting and adventurous pedestrian experience.

Safety perceptions

Adequate lighting throughout the day helps ensure malls can be used both night and day (Robertson 1994; Rubenstein 1992; Mehta 2013). This increases useable time on the mall, decreases perceived safety concerns, and prevents unwanted activity in the sheltered space. Bollards also provide safety reassurances, as they block vehicles from entering the pedestrian space. Successful malls should have adequate lighting throughout the mall, and bollards to deter vehicular traffic. Only two of the malls utilized bollards, while the other three allowed delivery or maintenance vehicles during restricted hours. When bollards are not used, a change in pavement or curb height was often employed. All five malls installed ample street lighting, which provided enough light to illuminate the mall during the evening. According to our cases, having a pair of street lights every 50 ft is ideal. During site visits, we noticed that all the malls utilized streetlights that illuminate in all directions, which could disturb residents living on upper floors. The malls could receive the same amount of lighting using directional light sources.

Paving material

Successful pedestrian malls should use unique and level paving (Ewing and Bartholomew 2013; Rubenstein 1992; Cooper Marcus and Francis 1998). A level surface ensures accessibility by all users, prevents tripping hazards, and can assist in water management. A unique paving material or pattern entices passing pedestrians create a sense of separate space, and adds character to the pedestrian mall – all of which attract users. Cobblestone was the most popular choice of paving material, used in four of the five malls. It was generally applied in a variety of patterns using many colors, which provided a sense of movement and interest. The cobblestone was especially enticing when placed next to the typical grey concrete of city sidewalks and worked as a lure to passing pedestrians. The Rochester pedestrian mall, which did not use cobblestone, instead used a variety of concrete colors with a curvilinear path running down the mall. The bright colors and unique pathway also worked to interest pedestrians and created a sense of movement down the mall.

Conclusion

We have attempted to construct as complete a database of US pedestrian malls as possible, and using a variety of locational, socioeconomic, and demographic factors, run a robust statistical analysis to better understand factors influencing the lifespan of the pedestrian malls. According to the statistical analysis, a number of contextual factors are relevant in explaining whether or not a pedestrian mall is successful. Greater population density contributes to the success of a pedestrian mall, while pedestrian malls in less dense cities are at a higher risk of closure. Moreover, the suggestion that smaller or mid-sized cities are more conducive to successful pedestrian malls is not supported by our analysis; instead, we find that there is no significant relationship between population and successful pedestrian malls. We suggest that this can be explained by the recent revival of pedestrian malls in larger cities. As a population's median age increases, pedestrian malls are more likely to close. Cities with a median age under 30 are more likely to have a more successful mall. As the percentage of white residents increases, pedestrian malls are less likely to close. As the percentage of white residents increases, pedestrian malls are less likely to close, however this is could be due to historical circumstances. Shorter pedestrian malls are more likely to be successful. This conclusion is consistent with other studies (Judge 2013; Pojani 2010). Being located in a city that is also a major tourist destination dramatically increases the chances of a pedestrian mall staying open. Similarly, being located in close proximity to a beach also contributes to the success of a pedestrian mall. As the percentage of sunny days increases, the chances of a mall closing decrease. The greater number of sunny days a city has, the more likely a pedestrian mall will succeed.

Additionally, there are site-specific factors planners and designers can implement to increase the success of a pedestrian mall. Although far from comprehensive, based on our case study analysis of five successful malls who fall outside the typical model, a number of design guidelines were found to be relevant. These include creating a sense of enclosure or containment by ensuring that building heights along the mall are at least three stories tall, with taller buildings at the corner to increase visibility; requiring the ground floor façade to have at least 50% window coverage to increase transparency; requiring awnings or tree cover along the mall to provide some protection from the elements, providing a variety of seating options along the mall, increasing visual stimulation through the use of planters, vegetation, and paving material to create contrast with the surrounding sidewalk, and finally to install adequate lighting to illuminate the mall at night.

Naturally, our cases are limited as they do not take into account economic or cultural activity on the mall, but limit their interpretation of success to whether or not the mall is still open. A much more thorough analysis involving a larger sample of pedestrian malls using a number of indicators and methods (direct observation, retail sales, etc.) is necessary to better understand the qualitative factors contributing to the success of a pedestrian mall. Furthermore, we were unable to include a proxy for the management and programming of the pedestrian mall, surely an important influence on whether or not the space is successful. This would require different methods, but suggests an important area of future research. Nevertheless, our results do suggest that even though planners have little agency over larger structural factor, they can enhance and increase a pedestrian mall chances of success through the implementation of improvements to the design and physical form of the pedestrian mall.

Notes

1. Available at https://osf.io/ybdev/
2. A correlation matrix found no strong correlations between independent variables. To check for multicollinearity, a variance inflation test was performed, and the results suggest there is no multicollinearity in the model.

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No potential conflict of interest was reported by the author(s).

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