Loneliness, Copresence, and the Purpose of Cities

by

Deniz Aydemir

B.S. Computer Science and Philosophy
University of North Carolina at Chapel Hill, 2013

S.M. Engineering and Management
Massachusetts Institute of Technology, 2025

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN URBAN STUDIES AND PLANNING

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

May 2026

Authored by: Deniz Aydemir
Urban Studies and Planning
May 8, 2026

Certified by: Fábio Duarte de Araújo Silva
Principal Research Scientist, Thesis Supervisor

Accepted by: J. Phillip Thompson
Professor of Political Science and Urban Planning
Chair, Department Committee on Graduate Students

Loneliness, Copresence, and the Purpose of Cities

by

Deniz Aydemir

Submitted to the Department of Urban Studies and Planning
on May 8, 2026 in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN URBAN STUDIES AND PLANNING

ABSTRACT

Loneliness is a global public health crisis. This crisis grows as work, leisure, and social life move out of shared spaces and into increasingly single-person homes. But when we do leave home, we experience the presence of many strangers with whom we never interact. This *ambient copresence* can be fundamental to reducing loneliness. We need to reorient the purpose of cities to include cultivating copresence and defending against loneliness.

We formalize Goffman's *copresence* as a spatial grammar that applies across social theories. We then use *social imagination* to describe how copresence shapes the way we feel connected to others, and how its absence feeds loneliness. We provide a formula for *copresence intensity* that categorizes types of copresence experiences in space.

Loneliness and its lethal consequences are especially severe in South Korea. To study copresence where it is most needed, we build an automated optimization loop to generate computer-vision pipelines for observing copresence, and analyze three weeks of CCTV footage from two stream-side walking paths across Seoul and Busan. Our analysis describes the forms and intensities of copresence that individuals experience in each space. We then propose principles for cities that aim to bring people together and recommend a dedicated city-staff role for loneliness. The project is available at copresencecity.com (archived at perma.cc/9G82-L79H).

Thesis supervisor: Fábio Duarte de Araújo Silva
Title: Principal Research Scientist

THESIS COMMITTEE

Supervisor

Fábio Duarte de Araújo Silva
Principal Research Scientist
Department of Urban Studies and Planning

Reader

James Aloisi
Lecturer of Transportation Policy and Planning
Department of Urban Studies and Planning

Contents

Part I

Among One Another

Chapter 1

Responsibility

1.1 What Cities Care About

Cities are humanity's longest-running experiment in living among strangers (Lofland, 1973), refined over thousands of years and in almost every climate we have managed to inhabit. They have outlasted empires, languages, and most ideas about what they are for. By the middle of this century, most people on Earth will live in a city or town (United Nations Department of Economic and Social Affairs, Population Division, 2025). The city is the structure in which most human life will take shape.

We have always asked a great deal of our cities. Housing, water, air quality, transport, public safety, climate adaptation, segregation, infrastructure decay, displacement, equity, poverty: each one anchors a discipline and decades of public investment both in cities and at other levels of government. Most of the work of urbanism is the discussion of which of these responsibilities to take up next in our cities and how (Jacobs, 1961). Each deserves the attention it gets and more.

Cities, towns, and villages all have a unique quality compared to other political institutions. They bring people into a contained space. This is so central to a city's purpose that we will claim that a city is dying if its population is declining. A city requires people, and a place for them to be. Whether or not they are managed by municipalities directly, this quality is how many of a city's responsibilities are derived: transportation and public safety, for example.

Cities have also cared deeply about public space. Parks, sidewalks, libraries, and public programming are also important responsibilities of the city. But these priorities have been distributed across various ideas like urban design, placemaking, arts and culture, and public services. These ideas often confuse aesthetic concerns and functional concerns, not knowing when one or another is being prioritized. Aesthetics and function are not disconnected. Despite being central to a city's raison d'être, this realm of ideas has not been given its own cohesive term like housing and transportation have.

Cities are fundamentally about people being together in a place. Cities should formalize this concern, and understand the implications of this responsibility.

1.2 A Missing Responsibility

Loneliness is a disease of isolation. Public health has named the crisis as such. The US Surgeon General has declared its impacts comparable to those of smoking tobacco (Office of the U.S. Surgeon General, 2023). The urban disciplines have begun to ask whether this is a question of cities (Heu and Brennecke, 2023), and the leading reviews now treat loneliness and isolation as collective health concerns rather than private ones (Leigh-Hunt et al., 2017).

Cities are where people come together, and we continue to choose them for that reason. But they should do better to defend against loneliness. The street, the stoop, the corner, the cafe, the library, the community center, the restaurant, the movie theater, the bus: these are the places where the life among strangers actually happens (Jacobs, 1961). Cities own these public spaces. Many shared spaces sit under municipal hands, and cities directly impact all the other privately owned shared spaces we inhabit.

Yet, cities have not yet proven to be the antidote to loneliness that, on the surface, they should be. Loneliness thrives in cities, often more than outside of them. The very density that defines urban life can drive a person inward (Simmel, 1903). The city's inability to utilize public space to defend against loneliness is an urban failure.

What is missing is a connection between the medical recognition of the loneliness epidemic and these municipal practices. Except for a few, cities have not yet acknowledged their role in this tragedy. They have not taken loneliness up the way they have taken up clean water or safe streets. But a city cannot be considered successful as a loneliness epidemic grows within it, and cities must be the first line of defense against this crisis. A city full of lonely people is a city failing at its job.

It is time the planners, designers, and urbanists elevate the scattered ideas of public space management, urban design, placemaking, and programming into a unified responsibility, what we will call the Experiential City, that is as prioritized as any other public health concern.

A city is not a city to the person who does not leave their home. A city is not a city to the person who never feels the presence of others. It is part of a city's fundamental purpose to be a place where we are in the presence of others.

Chapter 2

Loneliness

If you are feeling lonely, you do not have to be alone. You can find someone to talk to at findahelpline.com, anywhere in the world.

2.1 Social Disease

Loneliness is a feeling. It is the felt gap between the social connection a person wants and the connection they have (Perlman and Peplau, 1981). Loneliness is sometimes split into two types: emotional loneliness (the absence of close attachment) and social loneliness (the absence of a wider network) (de Jong Gierveld and van Tilburg, 2006). It is also framed as an adaptive signal, like hunger or thirst, that motivates us to repair social connection (Cacioppo and Patrick, 2008).

The two scales most used for loneliness, the UCLA Loneliness Scale and the De Jong Gierveld scale, have been refined over decades and behave consistently in many countries, over many years (Russell, 1996; de Jong Gierveld and van Tilburg, 2006). What the scales measure is a perception, not a count of contacts (Hawkley and Cacioppo, 2010). It is the feeling of loneliness that harms the individual.

Loneliness is a feeling that kills. The largest meta-analyses find that weak social connection raises the risk of early death by roughly the same margin as smoking and more than obesity or physical inactivity (Holt-Lunstad et al., 2010, 2015).

Loneliness damages the cardiovascular system and the mind. Longitudinal studies and meta-analyses link loneliness to higher rates of coronary heart disease and stroke after controlling for age, income, baseline health, and smoking (Valtorta et al., 2016). The same evidence links it to cognitive decline and to dementia, with effect sizes large enough to show up in population dementia projections (Luchetti et al., 2024). The mechanisms run through inflammation, cortisol, sleep, and the slow loss of the social cognition the mind needs to stay sharp. The body treats prolonged social disconnection as a threat.

Maybe the most tragic symptom of loneliness is its influence on self-harm and suicide risk. Loneliness raises suicide risk across every age group. We see this risk increasing even after controlling for

physical isolation (Calati et al., 2019). This means that the felt loneliness is complex and it cannot be assumed that non-isolation alone will be an antidote.

National cohort data from countries with high baseline loneliness rates show the same pattern of suicide risk at population scale (Lee et al., 2023). The effect is large enough that the suicide-prevention literature now treats loneliness as a primary risk factor, not a downstream symptom of depression. A person in deep loneliness is at risk of dying by their own hand. The risk is not theoretical and it is far too common.

We also know that more than half of gun-related deaths in the United States are suicides (Pew Research Center, 2025). The death toll of the loneliness epidemic is not isolated, and its tragic impact is almost certainly underestimated.

2.2 Modern Epidemic

This understanding of loneliness as a public-health epidemic is recent. The US Surgeon General declared loneliness an epidemic in 2023 (Office of the U.S. Surgeon General, 2023), the World Health Organization launched a Commission on Social Connection the same year (World Health Organization, 2023), and the New England Journal of Medicine now treats loneliness as a medical issue (Holt-Lunstad and Perissinotto, 2023).

We might expect digital connection to help. Most of us carry the entire social world in our pockets and the volume of digital interactions we can have at any given moment has never been higher. But modern technology has actually compounded loneliness.

The earliest longitudinal study of internet use in households found greater use predicted greater loneliness, and the finding has held up in larger samples since (Kraut et al., 1998). Heavy social-media users report more loneliness than light users in cross-sectional and longitudinal data (Primack et al., 2017). Random assignment to limit social-media use lowers loneliness inside a few weeks (Hunt et al., 2018). People in constant digital contact feel less and less met (Turkle, 2011). This makes sense, because loneliness is a feeling and not a count of how many people we have exchanged words with. Technology has made us more reachable than ever but that has only exacerbated loneliness. It has also pulled us out of in-person contact at the population scale (Atalay, 2024).

Adolescents are at the leading edge of this problem. In nearly every country with usable data, adolescent loneliness has risen since around 2012 in step with the spread of the smartphone (Twenge et al., 2021). They are the most-connected generation in human history and they report the sharpest rise in loneliness.

The epidemic is global. The first systematic review of population-level prevalence covering 113 countries finds problematic loneliness in every region for which there is usable data (Surkalim et al., 2022). The BBC Loneliness Experiment finds the experience present in collectivist cultures as well as individualist ones (Barreto et al., 2021), and in the United States, racial and ethnic disparities in loneliness

track the same income and education lines as other health outcomes (Iveniuk et al., 2025). Loneliness crosses socio-economic and cultural boundaries. It is everyone's problem.

2.3 Feeling and Isolation

Loneliness and isolation are connected, and correlated, but they are not the same. Loneliness is felt internally. Isolation is structural and countable: who a person lives with, how often they leave home, the size of their network, how many groups they belong to. Either can exist without the other.

A person who is objectively isolated may not feel lonely. A person surrounded by family may feel deeply lonely. Living with others does not necessarily save us from loneliness. Even people in shared housing or busy households are not exempt: what matters is the quality of perceived connection, not the count of people nearby (Santini et al., 2020; Cacioppo and Hawkley, 2009). The two can also reinforce each other: isolation raises the risk of loneliness, and chronic loneliness drives further withdrawal (Hawkley and Cacioppo, 2010; Cornwell and Waite, 2009).

Cities cannot directly cure a feeling. Cities also cannot directly prevent a car crash. But cities can use policy and design to reduce motor vehicle deaths on our streets. Can cities also use policy and design to reduce isolation and defend against loneliness?

Chapter 3

Retreat from the Commons

3.1 Home Alone

Isolation is the objective lack of social contact and relationships, measured by how often a person leaves home, how large their network is, and who they live with (National Academies of Sciences, Engineering, and Medicine, 2020; Cornwell and Waite, 2009). Any attempt by cities to address loneliness must grapple with each.

Americans now spend on average 99 more minutes per day at home than they did two decades ago, and correspondingly less time in workplaces, in shops, and in public space (Sharkey, 2024). The share of time Americans spend in any location outside the home has been falling for years, and this retreat predates the pandemic and has continued past it (U.S. Bureau of Labor Statistics, 2023). The structural form of isolation, for most people, is simply not leaving their homes.

The trend towards isolation can also be seen in shrinking social ties. Americans report smaller core discussion networks than they did a generation ago, with the share of people who say they have no one to discuss important matters with rising (McPherson et al., 2006). Associational life, the clubs and leagues and civic groups that once organized weekday evenings, has been thinning for decades (Putnam, 2000; Putnam and Garrett, 2020). People are joining fewer groups, and the groups they used to belong to are smaller and emptier than they used to be.

The household arrangements that used to buffer loneliness have thinned too. More people live alone in the United States than at any point in recorded history, and the same trend runs through most of the wealthy world (Cohen, 2021). Families are smaller and more dispersed. Aging in place is the policy default in most countries. This often means aging alone, and older adults living alone carry the highest measured rates of social isolation (National Academies of Sciences, Engineering, and Medicine, 2020; Santini et al., 2020). Not only do we stay at home more, the home has also become a more isolated place. Civic infrastructure must prevent solo living from becoming harmful isolation (Klinenberg, 2012).

3.2 Retreat

This trend towards isolation is difficult to fight. The traditional places, habits, and errands that pulled people out of their homes are thinning. While the smartphones and the pandemic have amplified it, this gravity of bringing activities into the home has been happening for decades (Atalay, 2024; Sharkey, 2024). Each retreat into the home from public space fulfills some convenience or comfort, but in sum they hollow out the commons and make our experience of public space worse. Capitalism and our human tendency toward convenience work together to pull daily life into the home.

Work

A large share of the workforce in wealthy countries now spends part of every week away from a workplace, and the share has held steady years after the pandemic ended (Barrero et al., 2023; Aksoy et al., 2022). The downtowns built around the daily commute have not returned to their former weekday density. Recovery rates in North American central business districts remain well below pre-pandemic baselines, and the cities most dependent on office work have recovered the least (Forouhar et al., 2025). The lunch counters, dry cleaners, and after-work bars that fed on that foot traffic have thinned or contracted (Althoff et al., 2022). The part of the city built around work has lost its weekday crowd.

Instead we have seen work move into the home. While cafes and coworking spaces have become more used, they have not made up the difference. And this makes sense. Working from home is convenient, and creates opportunities for employment that might not have existed before across long distances and for those who are caretakers or need flexibility in their schedules.

But this is a deeply isolating phenomenon. The workplace was where most met new people and made new connections. Friends and spouses were often discovered through serendipities involving work and being at work (Rosenfeld et al., 2019). These serendipities cannot yet be replicated through digital tools, and there is reason to be skeptical they ever could replace the unique impacts of physical proximity (Yang et al., 2022).

Bringing work home is an important benefit for many, but for those who are lonely or at risk of loneliness it eliminates a critical path to connection.

Shopping

Groceries, meals, packages, prescriptions, and much of what households used to leave the house for now arrive on their doorstep. Households with home delivery make measurably fewer shopping trips, and the drop holds in income brackets and product categories that have nothing else in common (Spurlock et al., 2020).

And the convenience is real. Delivery saves time for households that have very little of it. It increases access for those for whom the trip itself is the obstacle: the elderly, the disabled, the carless, the parent home with a sleeping child. While cities should make it easier for people to access the services they need, there's no denying that delivery provides value.

But the errand was providing an ulterior benefit. It was a reason to leave the house, and gave a person a consistent reason to be on the sidewalk (Jacobs, 1961). The chance encounters and the opportunities to recognize or speak to others are taken away when we don't need to leave our home.

Cars were already hollowing out the social value of the errand. When moving in a metal box, the social work of the trip was already significantly reduced. But now, even the limited work a car trip might have done is often being replaced by no trip at all.

Leisure

Over two decades, we see steady declines in the hours Americans spend at movies, in bars, at restaurants, and at organized in-person events, and steady gains in time spent on home-based and screen-based leisure (Atalay, 2024; Sharkey, 2024). The shift is not confined to young adults and it predates streaming. The number of close friendships and the frequency of friend contact have fallen sharply over the same window (Cox, 2021).

At home entertainment is often cheaper, and digital tools have made the experiences one can have from home increasingly compelling. If home can be a place of leisure and comfort, it should be.

But this too is isolating. The bar, the cafe, the pickup game, the movie crowd are a reason to share space with people, whether friends or strangers. The movement of leisure into the home has taken away another way to feel the presence of others.

3.3 Tragedy

This retreat from the commons carries many impacts with it besides isolation and loneliness. A tendency towards a more sedentary lifestyle is enormously hurtful to health, and not completely disconnected from loneliness either. Physical and psychological impacts do not separate cleanly. While we remain focused on the problem of loneliness and isolation, it is important to know that physical movement and exercise are also included in the types of health that our cities, and our public spaces, must help to promote.

This retreat creates a new tragedy of the commons, and the commons being depleted is our everyday social life (Hardin, 1968). Each retreat is individually rational, sometimes necessary. Together they hollow out the social life that public space exists to host. The streets and parks remain. What is lost is the value those spaces produce only when people are in them together.

The spaces where public life happens are the domain of the city. The streets, the sidewalks, the parks, the transit, the libraries, the public buildings, the squares: these sit under municipal hands (Foster and Iaione, 2016; Klinenberg, 2018). Of course, much of public life also happens in privately owned shared spaces. These too are where cities must exert their influence to help keep the commons alive.

Technologies and services will always have an incentive to increase convenience and reduce costs. But cities are the public entity that must defend the commons against this pull. Cities must focus their energy towards the roles, functions, and uses that keep the social commons alive and healthy. Loneliness is the clearest symptom cities must aim to heal with the levers they have.

Some governments have already named loneliness as a policy concern. The United Kingdom appointed a Loneliness Minister in 2018 and published a national strategy that put loneliness on the agenda of every department (HM Government, 2018). Japan followed in 2021, opening an Office for the Policy on Loneliness and Isolation in the Cabinet Secretariat after a wave of pandemic-era suicides (Cabinet Secretariat of Japan, 2021). Each of these treats loneliness as a public-health problem, addressed through services, awareness, and care delivery. But these are national strategies, run through ministries of health and care delivery, not through the spaces where loneliness actually happens. The role of the city in this epidemic has not yet been formalized. We will try to take a step towards that formalization here.

Chapter 4

Between Alone and Together

4.1 Public Life

To understand what we lose when we lose our public life, we can ask what a social theory of cities looks like. We glance at three seminal theories.

Granovetter's weak ties, those casual acquaintances we barely keep up with, carry most of the information and positive opportunity in our lives (Granovetter, 1973). Coleman and Putnam treat trust and reciprocity as social capital, built up through repeated dealings in a community and drawn down by isolation (Coleman, 1988; Putnam, 2000). Habermas treats public life as a sphere of reasoned encounter, where strangers meet as a public and work out what they share (Habermas, 1989).

These theories, and much else of existing social theory, attempt to describe how our interactions and relationships shape the way we think about community, norms, and belonging. But this does not tell the whole story.

Most of our social experiences are not social interactions. We frequently see, walk by, sit near, and notice others. We only interact with a small subset of those we are near. In cities, this divergence between who we are near and with whom we interact is especially pronounced. We might rub shoulders with hundreds of people for every one interaction. On a walk down a busy street in New York City, that can become thousands.

Any urban social theory, especially one concerned with loneliness and isolation, must address the vast space between being alone and together.

4.2 The Missing Middle

Observers have addressed this middle space between alone and together.

Lofland took seriously the world of strangers as a social order with its own rules of bearing and recognition, and treated public life among unknowns as a competence we learn (Lofland, 1973). Goffman drew the line between focused and unfocused interaction, considering the conduct of bodies who share a room without engaging each other. He named civil inattention as the everyday discipline by which we acknowledge a stranger and then look away (Goffman, 1963). Sennett described public life as a structured form of civil conduct among strangers and traced its long decline as private life crowded the public form out (Sennett, 1977). Whyte counted who lingered on plazas and who they sat near, and timed the small adjustments of bodies sharing a public room (Whyte, 1980). Jacobs described how the sidewalk becomes a neighborhood as we register and feel the presence of those around us (Jacobs, 1961). Oldenburg named the third place, the bar and the cafe and the barbershop, the rooms where unscheduled encounter happens by structural design rather than by appointment (Oldenburg, 1989).

These observers have each described a form of public life, and much of what they describe exists in this middle space. This space deserves a unifying language that can connect and distinguish the many ways we can be around each other.

Before we make claims about which ways of being around strangers are better or worse, we want to illuminate the phenomenon itself. What are the different ways we can be around those we do not know?

4.3 Copresence and Invisible Ties

First, we consider Goffman's modes of focused and unfocused interaction. Civil inattention may be a form of fleeting engagement, but even that small interaction between strangers is not the interaction we have with most strangers. We often will be near or walk by others with whom we make no eye contact, or even glance at. This is very normal. But we do know they are there. Anyone will tell you that walking on a street with any number of other people is not the same as walking on a street alone.

Even unconsciously, the human mind registers the presence of others in a room and the human body reacts (Qi et al., 2020). Being around others is not a trivial state that should be overlooked, and the full spectrum of the ways we can be around others is exactly what shared spaces in cities offer.

So we need a way of considering the experience of being around others that does not necessarily require conversation, engagement, or even conscious acknowledgment. To describe the general phenomenon of being around others, we'll use Goffman's term *copresence*.

Copresence is the gathering of bodies in a single physical setting where they are mutually available to each other's senses (Goffman, 1963). It spans the full range of how we can be around others, from sharing a sidewalk without acknowledgment to a full conversation. For any physical engagement, there must first be a form of copresence.

Whyte and Jacobs were watching copresence when they watched plazas and sidewalks, and Lofland and Sennett were describing the conduct that copresence makes possible, even if none of them used the word. It is through copresence that we see what others wear, we overhear their stories, we notice their confusion. Copresence is the substrate through which a society's social rules and civil conduct are ingrained. Very often copresence without conversation is enough to learn a society's norms. Often, copresence turns into Goffman's civil inattention.

Copresence is not only experienced with strangers, and it is not only experienced outside the home. But in a city, in public spaces, copresence with unfamiliar people and without engagement is the vast majority of our experience.

It is also the layer cities most directly shape, since sidewalks, transit cars, and parks are physical spaces where people share space whether or not anyone speaks.

We can adopt Granovetter's language of social ties to describe the kind of connection copresence creates (Granovetter, 1973). Strong ties are those we know and engage with often. Weak ties are those we know but do not engage with often. *Invisible ties* are the latent social relations we have with the people we are copresent with but do not know well enough to count as weak ties.

Chapter 5

Social Imagination

5.1 Imagination

Loneliness is a feeling about one's social well-being, but it is not the only one. There are many ways we can feel about our social health and our social connectedness, even if these feelings may not always match reality.

We will call a person's felt picture of where they stand among others their *social imagination*. It is the sense one carries of belonging or not belonging, of being known or being a stranger, across the full range from intimate connection to public familiarity.

We won't be able to formally constrain the space of social imagination. But if you make a friend at a coffee shop, or smile at someone on the subway, or notice someone's shoes, we will consider the impact these moments have on you as part of your social imagination.

The picture is not built only from small moments with individuals. A nation can be held in the mind as an imagined community by people who will never meet, sustained by shared print and shared narrative (Anderson, 2006). A neighborhood is held in the mind by people who periodically pass each other.

Loneliness is a form of social imagination. It is the felt gap between the social connection a person wants and the connection they have, and that gap is interior (Perlman and Peplau, 1981). It is the picture of where one stands relative to a wanted social life. Chronic loneliness can in turn shape social imagination in other ways. The same crowd can be perceived differently by those who experience loneliness and those who do not (Cacioppo and Hawkley, 2009; Hawkley and Cacioppo, 2010).

5.2 Invisible Ties That Bind Us

Copresence is the material that creates invisible ties and molds our social imagination.

A few words with a barista, a nod from a regular at the same train stop, the small civil exchange at a checkout: people who trade more of these report higher belonging and better mood that evening, and the lift holds for introverts as well as extroverts (Sandstrom and Dunn, 2014a,b). These moments of copresence are especially beneficial for lonely people, who disproportionately benefit from positive brief contacts (Russell et al., 2012).

But the social imagination is impacted not only by small interactions but also through simply noticing others. The person we see often enough to recognize is doing work in our social imagination even when no exchange takes place (Milgram, 1977). The familiar stranger is an important concept that highlights the strength of copresence even in one of its weakest forms. The presence of familiar strangers creates a feeling of connection with no direct interaction at all.

These invisible ties also impact the way we think about others and our communities. Repeated exposure to people unlike ourselves lowers prejudice (Allport, 1954; Pettigrew and Tropp, 2006). This is what we hope diverse third places provide, and is the reason social mixing is a social priority as well. When we overhear someone who does not look like us, we may gain a new sympathy for them. This expansion of our social imagination can, in turn, impact our politics and how we think about our communities.

5.3 Negative Copresence

Copresence is not always benign.

While negative interactions do not affect lonely people disproportionately (Russell et al., 2012), lonely people can subconsciously perceive ambiguous social moments as threatening (Cacioppo and Patrick, 2008; Cacioppo and Hawkley, 2009). Not all copresence results in positive effects.

Density itself can have a negative impact too. Crowded rooms can deepen isolation rather than relieve it. Simmel named the protective reserve that lets a person share a sidewalk with thousands by reading those thousands as scenery (Simmel, 1903). Riesman named the lonely crowd, a society in constant company that feels less and less seen (Riesman et al., 1950).

Copresence is also not experienced uniformly. The experience of copresence while walking for a Black man in the United States can be much more threatening than mere civil inattention, and the communal feeling of a shared place is not shared evenly by all demographics (Cadogan, 2016). An observer's identity changes the read of the room before density does anything at all.

The copresence we experience, and the invisible ties it creates, are richly complex. But they are still the substrate that forms our social imagination.

5.4 Focusing on Invisible Ties

Invisible ties deserve their own focus. Close ties carry emotional support, and their absence leaves a loneliness public life cannot reach (Holt-Lunstad et al., 2017). Weak ties carry information and opportunity (Granovetter, 1973). Invisible ties do something different. They build the public familiarity through which a person comes to feel they belong to a place. Outside the family, they are also where weak and strong ties begin.

A city cannot manufacture a friendship. It cannot put a close confidant in a person's life, and it cannot replace what a close confidant provides. Cities can too easily defer the problem of community by treating connection as a private matter. But being among strangers is fundamental to the experience of a city, and the public spaces where copresence happens are the spaces the city owns and shapes.

Of course, cities should help people build richer connections where they can. The everyday copresence of strangers, the nods, the overheard conversations, the familiar faces at the same train stop, is where public familiarity and a sense of belonging are made. It is also where cities have direct leverage. Sidewalks, transit, parks, libraries, and the privately held shared spaces cities influence are where invisible ties form.

This is the responsibility cities should take on. They cannot cure every form of loneliness but cities can design a public realm that cultivates copresence and invisible ties.

Part II

Copresence

Chapter 6

A Grammar

6.1 Eisner's Grid

Michael Eisner has a 2x2 grid to describe the kinds of experiences a person can have.

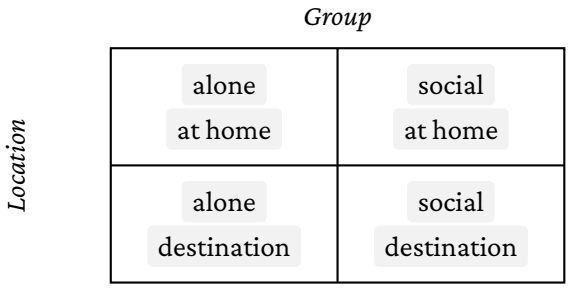


Figure 6.1: The possibly apocryphal Eisner grid of experiences

While the attribution of this grid to Eisner is lost to the wind, we can imagine he might have used it to segment the market for experiences and entertainment. We can see why this might be useful. A company like Disney would want to understand the range of entertainment experiences an audience member can have, and then be precise about which subdomain of those experiences it wants to target.

Our purpose is to understand and precisely describe the types of copresence we can have. We can call these copresence experiences, but our experiences will be a bit different than Eisner's. We want to understand these experiences better so we can understand what forms of copresence cities should target. Like Eisner, we will consider which dimensions are most important to copresence experiences, and build a grammar based on those dimensions.

For now, we defer any concern with what is externally knowable or observable. Instead, we will focus on representing the phenomenological reality of copresence. Our grammar should be able to describe the different types of copresence experiences that lead to different impacts on our social imagination.

6.2 Building the Grammar

We can take Goffman's definition as a starting point: people experience copresence when they are physically available to one another's senses (Goffman, 1963).

6.2.1 People

Every experience of copresence between two individuals can be represented as an arrow from one person to another. If two people are experiencing each other's copresence, then there is an arrow from each person to the other.

Figure 6.2: Copresence with two people

We can call each directed copresence relation a copresence arrow.

If an individual is alone with nobody else around, the experience contains one person, and there are no arrows.

Figure 6.3: One person alone

But if there is more than one person in an experience, those people are always experiencing some form of copresence. We know that the mere presence of others changes the way people perceive and respond to a setting, even if subconsciously (Zajonc, 1965). But even if we assume the two individuals did not notice each other, we still want our copresence grammar to be able to describe that scenario. What matters for the grammar is physical availability to the senses.

If there are multiple people in an experience, there is an arrow in every direction between each of them.

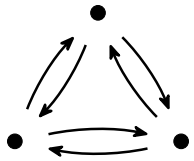


Figure 6.4: Copresence with three people

Our copresence experience starts as a complete symmetric directed graph.

How do we decide the boundaries of an experience? Using Goffman's definition is not clear here, especially in open spaces. Every person might have a different set of people who are available to their senses. Person A might be in the plaza and able to see both B and C. Person B may only be able to see A. If we want to indicate this complexity, we can draw all three and omit an arrow between B and C to show that they are not in copresence with each other.

In crowded, open spaces this branches further. If C sees another person D, and D sees E, we have a copresence chain. When there are discrete boundaries to a space, like a restaurant, we might describe a whole copresence experience with one graph. In open spaces we accept the imperfection at the borders.

For our purposes we keep it simpler: we describe a copresence experience from the perspective of one individual. We assume every individual's perception of others is bounded. We can indicate the individual whose perspective we are representing with a filled-in circle, and others with circles.

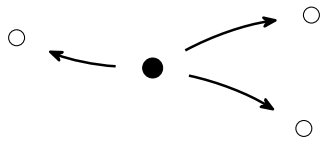


Figure 6.5: Copresence from an individual perspective

The arrows by themselves do not describe much. They show that a directed copresence relation exists, but nothing else. A copresence experience with two people could be two strangers walking by each other in a park, or a mother eating dinner with her daughter.

To begin to show the difference, we can label the arrows to enrich our graph.

6.2.2 Familiarity

The experience of being with someone you know well versus someone you do not know at all is different and consequential to our social imagination. Familiarity is the first relational dimension we

add to our grammar. A familiarity label attaches to a single copresence arrow, so two people can hold different levels of familiarity for each other.

We normally think of familiarity as a total ordering of categories.

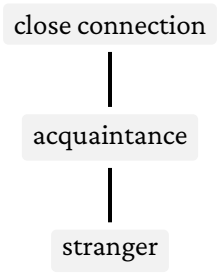


Figure 6.6: Familiarity, simple

In fact, this maps to our augmentation of Granovetter's categories of social ties, where we consider invisible ties to be those with whom we share copresence but remain below weak ties (Granovetter, 1973).

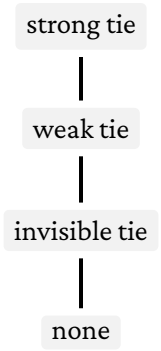


Figure 6.7: Familiarity, augmented Granovetter

We can also use Milgram's concept of familiar strangers to create another possible structure of familiarity (Milgram, 1977).

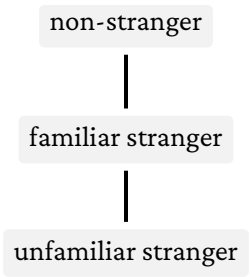


Figure 6.8: Familiarity, Milgram

But in reality, familiarity is not always a total order. There are many people with whom we may have different types of familiarity, but it may be difficult to say which one we are more familiar with, or what "familiar with" even means.

We can use a partially ordered set to describe this nuance.

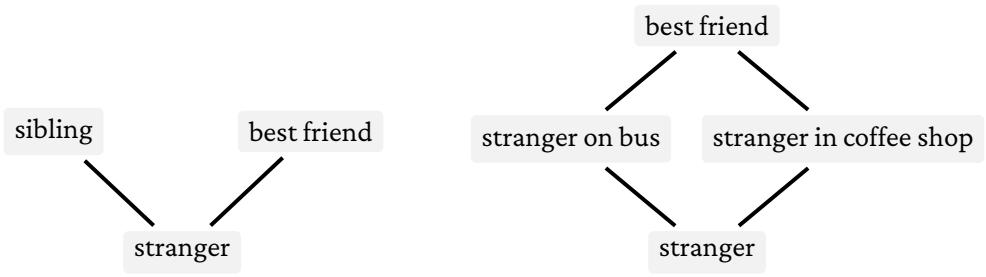


Figure 6.9: Potential incomparable familiarities

A partial order is flexible for many different conceptions of familiarity, and thus we allow our grammar to include this complexity if needed for a given application.

But for most purposes we will reduce familiarity to a total ordering so we can speak to a clear level of familiarity. We can imagine combining Granovetter's familiarity as intimacy and Milgram's familiarity as recognition into a single ordering.

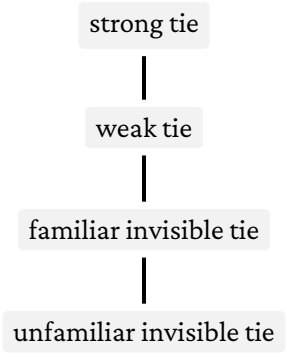


Figure 6.10: Familiarity, augmented Granovetter + Milgram

When we label the arrows in a copresence experience with a familiarity that corresponds to the relationship, we better represent the details of the copresence. We can imagine a coffee shop with one couple, one individual, and one employee. Maybe the individual recognizes the employee but not vice versa.

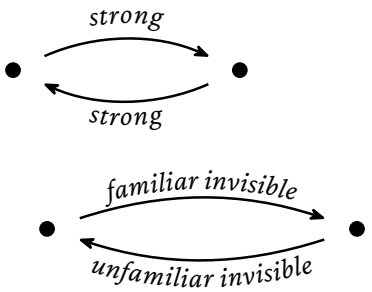


Figure 6.11: Coffee shop, with *unfamiliar invisible ties* omitted

6.2.3 Interaction

The copresence between people in an experience is not only described by how well they know each other, but also by what they are doing with each other. We can add interaction as a second relational dimension in our grammar.

Figure 6.12: Interaction, simple

We can use Goffman's distinction between unfocused and focused interaction to create another possible structure of interaction (Goffman, 1963).

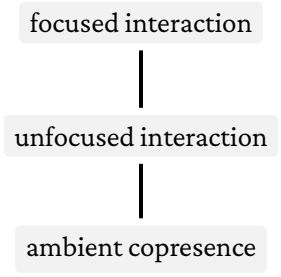


Figure 6.13: Interaction, modified Goffman

Goffman uses *co-presence* to describe a distinct mode that lies below interaction. The copresence of our grammar is more general, and we use the concept as a prerequisite for all forms of interaction,

not as a distinct one. For that reason, we modify his term and describe copresence that does not rise to focused interaction as *ambient copresence*. We will speak more about ambient copresence later.

Again, we use a partially ordered set to acknowledge that interaction has degrees while still supporting nuance.

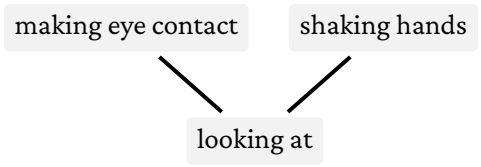


Figure 6.14: Potential incomparable interactions

Different people may disagree on whether making eye contact or shaking hands is a deeper form of interaction, and on what a "deeper" form of interaction even means. Our partial order structure supports this uncertainty, but again will be reduced to a total ordering when we want to speak of degrees of interaction.

Some forms of interaction are bidirectional. You cannot shake someone's hand without their hand being shaken. But you can look at someone without them looking at you. As with familiarity, interaction labels attach to a single directed copresence arrow.

The experiences we have been describing here are really moments in an experience. In reality, the experiences occur over time as a sequence of moments.

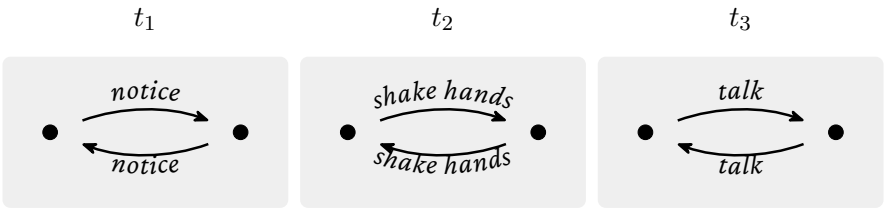


Figure 6.15: Copresence experience interactions over time

We continue describing moments, and discuss time soon.

6.2.4 Position

Our copresence experiences contain the people, their familiarities, and their interactions. But we know that sitting in a crowded subway car with 30 strangers is not the same as being in a 100 square

meter plaza with 30 strangers spread out. We know that someone you see from 100 meters away cannot become a familiar stranger. We add position as the third relational dimension in our grammar.

When considering position, we want to understand not only how far away individuals are from each other, but also their positions relative to their orientation.

The presence of others is phenomenologically different when others are in front of us versus behind us. Individuals prefer to sit at edges of public spaces (Whyte, 1980), and visual prospect shapes how comfortable we feel in a space (Appleton, 1975). We can also consider the orientations of both people in a copresence pair: being face to face with someone is different from facing their back.

To support both distance and orientation, we can add three position variables to our graphs: the angle between the orientation and the arrow connecting the individual to the other person, the angle between the orientation of the other person and the arrow connecting the individual, and the distance between the two individuals.

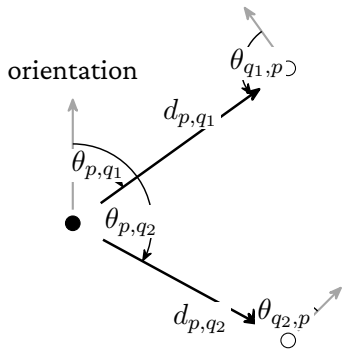


Figure 6.16: Individual copresence with distance and orientation

With people and these three relational dimensions, we have described much of the reality of a copresence experience. This is just a snapshot. The values of these relations are likely to change very quickly if people are moving in any way.

We can write a copresence moment as the set of relations between a focal person p and every other person q present. For each other person, we have familiarity f, interaction x, distance d, and two angles (θ_{pq}, the position of q in p's frame, and θ_{qp}, the position of p in q's frame), since the experience differs depending on whether q is facing p or facing away.

$$M_p(t) \;=\; \left\{ \left(f_{pq},\, x_{pq},\, d_{pq},\, \theta_{pq},\, \theta_{qp}\right) \;:\; q \in P(t) \setminus \{p\} \right\}$$

We use this to describe the moment of a copresence experience for an individual.

Person	*Familiarity*	*Interaction*	*Distance*	*Orientation* $(\theta_{pq},\, \theta_{qp})$
q_1	strong tie	focused interaction	$1.2\,\mathrm{m}$	$15°,\ 170°$
q_2	familiar invisible tie	ambient copresence	$3.5\,\mathrm{m}$	$45°,\ 120°$
q_3	unfamiliar invisible tie	ambient copresence	$8\,\mathrm{m}$	$110°,\ 60°$

Figure 6.17: A copresence moment from p's perspective

If we instead want to describe the full copresence in an experience without privileging a perspective, we can drop the focal person and write the moment as the set of all directed pairwise relations across everyone present.

$$M(t) \;=\; \left\{\, (p,\, q,\, f_{pq},\, x_{pq},\, d_{pq},\, \theta_{pq},\, \theta_{qp}) \;:\; p, q \in P(t),\, p \neq q \,\right\}$$

This would be the external perspective of a moment of a copresence experience.

6.2.5 Time

But those relational values are static only for a moment. A copresence experience is a sequence of connected copresence moments. A copresence experience for p is then an ordered sequence of such moments:

$$E_p \;=\; \big\langle M_p(t_0),\, M_p(t_1),\, \ldots,\, M_p(t_n) \big\rangle$$

Any part of the moment can change over time. Position and people most obviously: a person may move relative to another, or they may exit the boundary and no longer be in copresence with each other. Interaction can change as one might look, then talk, then go back to having no interaction. Familiarity may also change. Depending on the granularity of the familiarity chosen in the grammar, we might consider recognizing a face or learning a name to be an increase in familiarity, to say nothing of the familiarity changes that can occur over a long conversation.

As we apply the grammar, we will consider copresence moments to be the building blocks that build out a copresence experience. And that experience is what we will connect to our social imagination.

6.3 Outside the Grammar

6.3.1 Groups

We have not created an explicit way to indicate groups in these experiences. But two parts of the grammar, at times, can both serve as indicators of group membership.

Familiarity is a natural way to consider groupings. If an individual is very familiar with one other person in the copresence experience, and everyone else is a stranger, they are likely to be a group. One can see this in the coffee shop where a couple is sitting near a stranger.

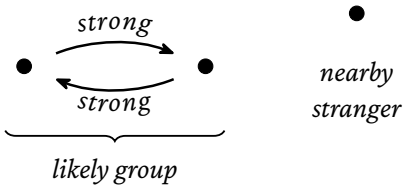


Figure 6.18: Familiarity as a cue for group membership

Position can also give away a group. If two individuals are in close proximity for a long time, we might consider them a group. Especially so if they are also very familiar.

But we can think of exceptions. Person A may be having a coffee with an acquaintance while their good friend attends the register.

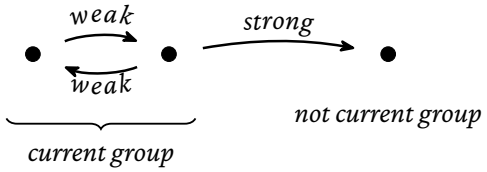


Figure 6.19: When familiarity and group membership diverge

People also enter, exit, become, and dissolve groups. When a student enters a classroom, they may scan to find their friends. If they find them, they may sit next to them. Do we consider them a group? If two individuals talking at a bar chat for an hour, become friends, and exchange numbers, but do not leave together, do we consider them a group?

Groups matter for copresence, but we will treat groups as an additional layer on top of our fundamental grammar. They can be inferred from familiarity and position rather than encoded as a primitive. Alternatively, they can be represented in whatever way makes the most sense for a given application.

6.3.2 Demographics and Social Mixing

Age, gender, and identity can shape how copresence impacts our social imagination. We know that contact between different groups can reduce prejudice and build civic ties (Pettigrew and Tropp, 2006).

This grammar could be extended to describe demographic details and more richly describe copresence with regard to mixing. Because we are focused on loneliness and isolation, we keep familiarity as the only included persistent quality.

6.3.3 Activity

Sitting, standing, walking, playing. The people in a copresence experience may be commuting to work and thinking about an important upcoming meeting, or they may be at trivia night playing with friends and observing others.

These states would reasonably impact the way we experience copresence. If our grammar describes two strangers making eye contact, if one of them is an employee at a coffee shop and the other is a customer, it is a different copresence experience compared to if both are strangers in that coffee shop. Someone sitting at a bar may react differently to a stranger speaking with them than someone commuting to work. The activity might determine the expectation for certain interactions and positions, or an individual's proclivity toward certain responses.

But we do not cover this in our grammar. Many spaces will have a unifying activity that is largely shared by all in the experience, such as a coffee shop or a subway car, and thus implied in the grammar. But some spaces, like a public park, may house many different types of activities and thus need extension in the grammar to be properly represented.

6.3.4 Possibility and Other Complexities

The latent affordance of a space matters but is not represented in our base grammar. It certainly feels different to be at home alone than to be in a park alone. One reason for the difference is that the two spaces have different possibilities for copresence.

Body orientation, head orientation, and gaze are not the same. The grammar reduces all this to one concept of orientation but a more nuanced understanding of copresence may choose to separate these different physical details to try to understand whether different combinations lead to different effects on how people experience copresence.

These, and plenty of other unmentioned distinctions, could be added to the grammar in some form. But we omit them intentionally to keep our focus on the most salient qualities of a copresence experience with regard to loneliness and isolation.

Chapter 7

Ambient Copresence

7.1 Copresence Intensity

The copresence grammar we have described has three relational dimensions over directed copresence relations. Those dimensions are not simple, and there is a lot of complexity embedded in the configurations that the copresence grammar can describe. This is a good thing, since this allows our copresence grammar to describe much of the nuance that exists within copresence, and fit that nuance into a reasonably unifying structure.

But for the purpose of loneliness, we might be able to reduce this complexity to a single number. Brief encounters with weak and invisible ties can affect belonging and mood, and especially matter for lonely people (Sandstrom and Dunn, 2014a,b). We can also intuitively understand this: being on a bus with two other people is a different experience than being on a bus with 30 other people.

We can use a new concept to summarize a copresence experience with a single number: the *copresence intensity*.

The copresence intensity is a scalar that quantifies the strength of impact the copresence experience is having on a given individual. We can use our grammar to produce a function that will determine the copresence intensity for a given individual in a copresence moment.

$$I_p(t) \;=\; \sum_{q \in P(t) \setminus \{p\}} \phi\big(f_{pq},\, x_{pq},\, d_{pq},\, \theta_{pq},\, \theta_{qp}\big)$$

The per-pair contribution ϕ is a non-negative function of the five-tuple describing the directed copresence relation from p to q. Summing across all others present means intensity grows naturally with the number of people. We leave ϕ unspecified here. Different research questions warrant different shapes.

In the simplest factorable case, ϕ decomposes into one weighting function per relational dimension:

$$\phi\big(f_{pq},\, x_{pq},\, d_{pq},\, \theta_{pq},\, \theta_{qp}\big) \;=\; w_f(f_{pq}) \cdot w_x(x_{pq}) \cdot w_\pi(d_{pq},\, \theta_{pq},\, \theta_{qp})$$

Here w_f maps familiarity, w_x maps interaction, and w_π groups distance and the two orientations into a single *position* weight, since proximity and mutual facing jointly determine how present another person feels. This factorization is convenient and interpretable, but the more general ϕ leaves room for cross-dimension effects that a product cannot express.

By reducing copresence moments to a single number, we can point to two copresence experiences and quantify a difference.

For many situations, this difference is intuitive. And with sensible weights, intensity should generally rise with more people present, position, familiarity, and interaction.

Figure 7.1: Possible copresence intensities

A copresence intensity function can be defined in the way that makes the most sense for a given analysis and understanding. Currently, we do not know which of the following is more intense.

Figure 7.2: Another set of possible copresence intensities

But maybe one day we will know. The choice of function is flexible to this learning over time.

It may be possible for two experiences with the same intensity score to feel very different. Maybe there should also be a copresence comfort that correlates just with familiarity, or a copresence effort that correlates with proximity and engagement.

Intensity is an oversimplification, but we use it because it gives us a reasonable way to classify copresence experiences along a spectrum.

7.2 Ambient to Engaged

It is reasonable to consider engagement with another as a high-intensity copresence interaction. If a stranger stops you on the street to ask you a question, it activates you much more than when the stranger walks by without noticing you. Even with those we know well, our attentiveness to them is certainly different when we are speaking with them compared to when we are not.

Engagement is also a relatively mutual and reciprocal form of copresence. Engaging with someone requires some amount of engagement back. So the intensity is, at least to some degree, shared.

We can call a copresence experience that involves focused interaction *engaged copresence* (Goffman, 1963).

But most copresence does not involve engagement, especially in cities. In Part 1, we described this as the space between being alone and together that cities afford their residents. We introduced *ambient copresence* earlier as copresence that does not rise to focused interaction. We can now give it a precise definition.

Copresence that involves either no interaction or unfocused interaction is ambient copresence (Goffman, 1963).

This gives our intensity a categorical band within which to operate. Both engaged copresence and ambient copresence can have varying intensities.

We expect ambient copresence to have mostly lower copresence intensity than engaged copresence, but the choice of weights can guide this differently. It would be reasonable to claim that standing shoulder to shoulder with someone for 10 minutes is more intense than a 10-second conversation.

7.3 Ambient Copresence in Public

Most copresence in cities is ambient, and most of it happens between invisible ties, people below weak-tie familiarity with whom we share copresence. We engage only a small fraction of these ties.

Engaged copresence with invisible ties is impactful on our social imagination. A nice conversation with a stranger can do a lot to raise spirits, and positively impact lonely people (Sandstrom and Dunn, 2014a).

But there are two reasons to care about ambient copresence with invisible ties. All engaged copresence with invisible ties must first start as ambient copresence. And the vast majority of copresence with invisible ties never moves beyond ambient, yet still does work on our social imagination.

Ambient copresence is the substrate of urban public life. Our grammar can describe many forms of copresence, but ambient copresence is the one cities can most directly shape. Cities have the most

immediate control over the conditions that generate ambient copresence and shape its intensity. This is how cities should begin to address loneliness.

7.4 Measurement

The grammar we have provided here is a tool to better understand what makes up a copresence experience. The grammar provides a single framework with which to describe various types of social theories.

We are also interested in measurement and discovery. This grammar provides a system that can be used to measure copresence in real settings. In-person studies can follow individuals through their experiences and ask them to recount their feelings. Computer vision can detect copresence patterns from footage of public space at scale.

We present this grammar as groundwork for further research and measurement of how we experience the presence of others, and how it might help us combat loneliness.

Part III

Walking Alone in Korea

Chapter 8

Crisis in Korea

8.1 Loneliness and Isolation

Loneliness is the felt gap between the social connection a person wants and the social connection they have. In South Korea, this epidemic is especially acute and life-threatening.

In Seoul, 62.1% of single-person households report loneliness (Government, 2024).

Loneliness is also extremely harmful in Korea. It correlates with depression risk and weak network ties (Park and Kim, 2022). Living alone and feelings of loneliness both raise suicide risk, especially for working-age Koreans (Moon et al., 2025).

The death toll from suicides is devastating. Korea has ranked at or near the top of Organisation for Economic Co-operation and Development (OECD) nations in suicide rate for two decades. Recent figures put the suicide rate at 27.3 per 100,000 population, more than twice the OECD average of about 11 (Statistics Korea, 2023; OECD, 2025).

Isolation is the physical phenomenon that both brings about and compounds loneliness.

In 2024, single-person households (1인가구) made up 36.1% of all households nationally, and 39.9% in Seoul (Statistics Korea, 2024), above the OECD-36 average of 32%. Korea's share has more than doubled since 2000. Nordic countries, where solo living is near 44%, climbed to that range over a much longer arc (OECD, 2024).

Household arrangements that historically buffered against isolation are experiencing one of the steepest deteriorations in the OECD.

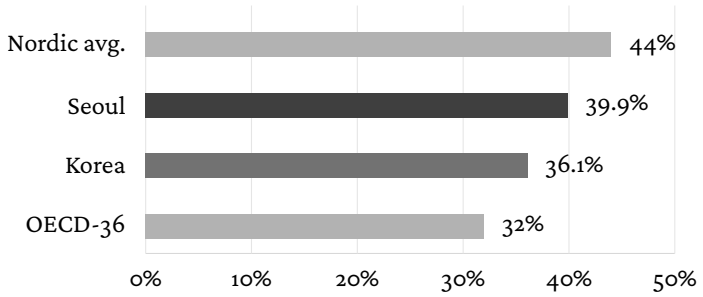


Figure 8.1: Single-person household shares

Elderly isolation is a drastic example of this recent trend. In 2023, 32.8% of older Koreans were living in single-person households, up from 19.8% in 2020. The share living with adult children dropped from 20.1% to 10.3% over the same period (Ministry of Health and Welfare, Republic of Korea, 2024).

Withdrawal among the young is also documented. The Korean Ministry of Health and Welfare estimates that around 540,000 young adults aged nineteen to thirty-nine are socially withdrawn, roughly 3% of that age cohort, the population captured under the term 은둔형 외톨이 (eundunhyeong oettori) (Ministry of Health and Welfare, 2023). About 70% live with family and still remain isolated, and half report some kind of mental or physical health problem. Cohabitation does not resolve this withdrawal in young adults.

Isolated deaths have become common enough that they have earned their own term: *godoksa* (고독사), meaning lonely death. *Godoksa* refers to someone who dies alone and is found only after some time has passed. There were 3,661 such deaths recorded in 2023, 1.04% of all deaths. This statistic continues to rise yearly (Ministry of Health and Welfare, 2024).

8.2 Policy and Intervention

In 2021, Korea began to officially acknowledge the crisis. The Lonely Death Prevention Act (고독사 예방법, godoksa yebangbeop) was enacted, mandating a national survey, defining lonely death in law, and requiring regular prevention plans (Republic of Korea, 2021).

Korea is also one of the few states to have built policy to address felt loneliness directly. “Not Lonely Seoul” (외롭지 않은 서울) is the single-person household safety plan that has directed KRW 451 billion (approximately $327 million) to fund counseling, peer-group programs, shared meals, a 24-hour hotline, and AI check-in calls for higher risk solo residents (Government, 2024).

Korean public-health bodies have acknowledged the scope of this crisis.

8.3 Our Contribution

The magnitude of harm in Korea, more than almost anywhere else, warrants an examination of how loneliness and isolation connect to the copresence we experience in public spaces.

At-home isolation is very likely at the center of the loneliness crisis in Korea, but it is important to understand how the use of public space relates to and might help us mitigate this crisis.

To this end, we ask two questions. What kinds of social environments are people experiencing in public spaces in Korea? How can our copresence grammar help us understand how these public spaces might impact our feelings of loneliness?

Chapter 9

Observing Public Spaces

9.1 Method tradition

There is a long tradition of observing public life to better understand how we behave socially.

Whyte camped on plazas with notebooks and timelapse cameras and counted where bodies sat, who lingered, who paired up, who stayed alone (Whyte, 1980). Gehl built a parallel program in Copenhagen, watching how people occupy the space between buildings and treating that occupation as the readable surface of public life (Gehl, 1987). Mehta brought systematic coding to street-life observation, recording posture, activity, and social configuration (Mehta, 2013).

Now, we can record longer, higher-quality footage than before, and computer vision lets us analyze public life at a scale that would previously have been too burdensome. Salazar-Miranda and the MIT Senseable City Lab take Whyte's own films and compare them to footage from 30 years later to discover a long-term decline in lingering and group encounters at the same sites (Salazar-Miranda et al., 2025). He and colleagues take a similar approach with webcam data to revisit Gehl's principles across multiple sites (He et al., 2026).

To get the quality of footage required to make meaningful observations, researchers have needed to use their own footage or place their own cameras. Most observation-based research has been limited to a few hours of footage (Salazar-Miranda et al., 2025), or to a single site (Williams et al., 2019). This has constrained the duration and volume of footage available to study behavior in public space.

9.2 CCTV

Many cities have placed CCTV cameras to help count pedestrians or traffic, and much of this footage is publicly accessible. The Seoul Metropolitan Government, for instance, operates a public live-camera

portal that surfaces walkway and waterway feeds (Seoul Metropolitan Government, 2024).

When we are able to record CCTV footage, we can see what happens in a public space over an extended period of time, ranging from hours to months.

Using CCTV footage comes with significant constraints. For one, the site selection is left to wherever the existing cameras happen to be. Many of these cameras are designed to observe car traffic, and show very little about the human-scale experience on the ground.

We can take public Korean traffic CCTV cameras as an example.

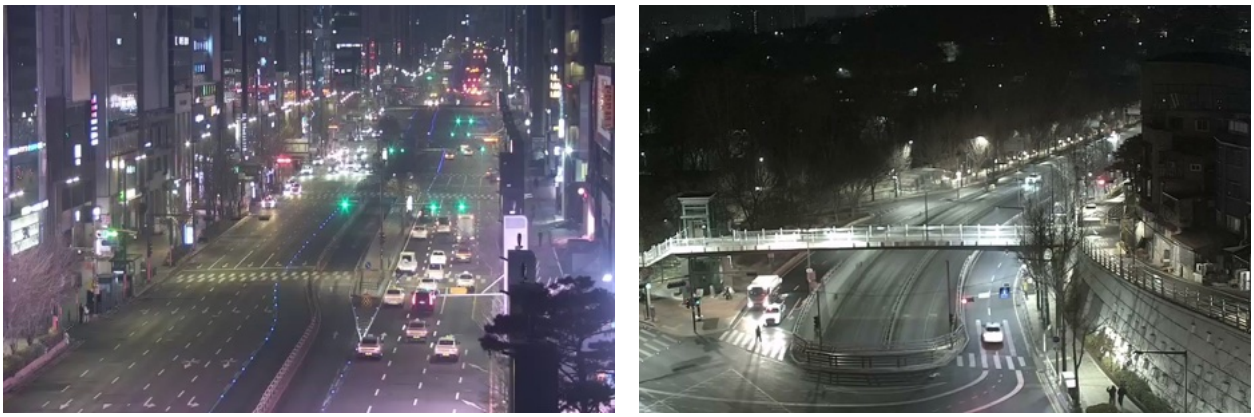


Figure 9.1: Two examples of Korean CCTV cameras

Those cameras that do show pedestrians are so high up that it becomes very challenging to see how many people there are and what they are doing, let alone to build a computer vision pipeline to detect it automatically.

This also means it is rare that faces, individuals, and demographic information can be identified from these camera feeds. While limiting the observational findings, this also builds in a layer of anonymization and privacy by default.

With CCTV footage, we can only get a glimpse of what public life looks like outdoors. But if we can work within these constraints to create a usable form of measuring copresence in CCTV footage, we may be able to take a first systematic look at what public copresence looks like at a larger scale.

Chapter 10

Measuring Copresence

10.1 Spaces

We measure copresence in two Korean stream-side paths: Seongsan in Seoul and Oncheoncheon in Busan. Both are linear walking corridors with pedestrians visible enough for tracking, and together they give a first cross-city test of the method.

Seongsan. Seoul, Seongsan 2-dong, Mapo-gu.

Oncheoncheon. Busan, Sumin-dong, Dongnae-gu.

Figure 10.1: The two primary stream-side spaces, with visible zones indicated

For each camera feed, corresponding points between the video frame and Google Maps are used to estimate a homography, which maps image pixels into ground-meter coordinates. Once that mapping exists, the same analysis zone, distance, density, and copresence calculations can run on the footage. This makes the measurement system portable because new camera feeds can be added by defining the map correspondence and analysis zone, without rebuilding the rest of the pipeline.

The main comparison uses nearly matched analysis zone polygons: 486 m^2 at Seongsan and 476

m² at Oncheoncheon. This makes the four copresence categories more comparable across the two spaces.

Yangjaecheon in Seoul, Yangjae 2-dong, Seocho-gu, was considered during method development but excluded from the thesis analysis. Its analysis zone is much smaller and more distorted than Seongsan and Oncheoncheon, so the resulting copresence measures are difficult to compare across spaces. Data from Yangjaecheon remain available at copresencecity.com.

The analytic sample covers clips recorded from April 12 through May 10, 2026, Korea time. April 12 begins after 09:00 KST because the database window begins at midnight UTC. All included clips are 30 fps, 300-frame, ten-second samples captured at randomly varying intervals of four to eight minutes. Seongsan contributes 5,531 clips and Oncheoncheon contributes 5,848.

10.2 Autoresearch and Pipelines

To measure copresence from video, the system first has to detect pedestrians in each frame and link those detections into tracks across the clip. Off-the-shelf detector and tracking algorithms do not always transfer cleanly to top-down CCTV footage, where camera angle, height, distance, and pedestrian scale vary significantly from one view to another. A stock pipeline can do well, but it often needs tuning for a given camera feed before its tracks are reliable enough for use in further analysis.

This is why we use automated optimization loops: candidate detection and tracking pipelines are repeatedly tested against held-out ground truth, and the best-performing versions are kept (Karpathy, 2026). We use one general loop to find a strong CCTV pipeline, followed by separate camera-specific loops for Seongsan and Oncheoncheon. The camera-specific loops fine-tune the post-processing of that pipeline to each camera.

Each candidate is scored with Higher Order Tracking Accuracy (HOTA), with detection accuracy, association accuracy, and IDF1 used as breakdowns. HOTA matters for downstream copresence analysis because it scores a pipeline's ability to both detect people and keep their identities stable across frames (Luiten et al., 2021). On MOTChallenge benchmarks, strong public-scene trackers often report HOTA scores in the mid-0.60s, and top systems on MOT17 and MOT20 still tend to sit below 0.70 on crowded pedestrian footage (Dendorfer et al., 2021; Luiten et al., 2021).

Stage	Validation data	Role
Base optimization loop	MOT17; MOT20; VisDrone; Oxford Town Centre; manually labeled Korean CCTV clips	Select detector, tracker, and post-processing families for CCTV-like footage
Camera-feed calibration loops	Seongsan labeled clips; Oncheoncheon labeled clips	Tune final parameters to each camera while keeping the downstream measurement logic fixed

Table 10.1: Validation data used in the autoresearch optimization loops

Detector candidates
YOLO11-X (Khanam and Hussain, 2024)
YOLOv10-L, CrowdHuman-pretrained (Wolff et al., 2026)
YOLOv10-L, VisDrone-tuned (Zhu et al., 2022)

Tracker candidates
ByteTrack
BoT-SORT
OC-SORT
Deep OC-SORT
StrongSORT
BoostTrack
HybridSORT
ImprAssoc
DiffMOT
FastTracker
TrackTrack
UCMCTrack
SAHI with ByteTrack

Table 10.2: Detector and tracker candidates tested in the base optimization loop

Both final pipelines use YOLO11-X for detection and OC-SORT for tracking, but their post-processing settings differ because the two camera views produce different detection and tracking errors.

Camera feed	Final stack	Key camera-specific choices	Clips	HOTA
Seongsan	YOLO11-X, confidence 0.05, image size 1600; OC-SORT, thresholds 0.25, max age 60	Minimum 5 detections and 1.0 s duration; reject boxes wider than 1.2× height; stitch 16-frame gaps within 75 px; smooth over 10 frames	20	0.725
Oncheoncheon	YOLO11-X, confidence 0.05, image size 1280; OC-SORT, thresholds 0.30, max age 125	Minimum 6 detections and 0.4 s duration; reject very wide boxes and short middle-of-clip appearances; stitch 16-frame gaps within 40 px; smooth over 8 frames	21	0.669

Table 10.3: Final camera-feed-calibrated pipeline settings and validation scores

For each camera feed, the best calibrated pipeline was selected and used for all downstream analysis. More details on the pipelines are available at copresencecity.com.

10.3 Copresence detection

10.3.1 Companion groups

Our analysis first turns pedestrian tracks into companion groups, then uses those groupings to identify which nearby people are outside a solo pedestrian's companions. Each track's footpoint, the pixel coordinate at the base of its bounding box, is projected through the per-camera-feed homography into ground-meter coordinates. This gives each pedestrian a ground-meter trajectory within the analysis zone.

Tracks are grouped at the clip level when their trajectories stay close, move together, and persist as a stable unit. This follows the basic intuition of F-formations and trajectory-based group detection: groups are not just people who are near each other in one frame, but people whose positions and motion make them read as a shared social unit over time (Kendon, 1990; Nasri et al., 2024). Groups are stable over the full 10-second clip, and each track receives one group identity per clip.

Criterion	Value	Meaning
Shared time	$\geq$2 s overlap in analysis zone; $\geq$35% shared clip presence	Ensures the pair is observed together long enough to compare movement
Pair distance	Median $\leq$1.8 m; 80th percentile $\leq$2.4 m	Keeps companion groups spatially close for most of the clip
Near/far share	$\geq$60% of shared frames within 1.8 m; $\leq$30% beyond 2.7 m	Prevents a brief close pass from becoming a group
Distance stability	Distance IQR $\leq$1.1 m	Favors pairs that keep a stable spacing while moving
Motion	Speed $\geq$0.25 m/s; heading cosine $\geq$0.65; speed difference $\leq$2.2 m/s	Requires people to move together, not just near each other
Rescue rule	Box overlap $\geq$0.20 or close-box share $\geq$0.55; center gap $\leq$1.20$\times$ box scale; vertical overlap $\geq$0.35	Keeps obvious companion pairs when heading estimates are noisy
Opposite-heading rescue	If headings appear opposite: box overlap $\geq$0.50 or close-box share $\geq$0.80	Avoids merging passersby while still rescuing obvious side-by-side pairs
Short-track rescue	$\geq$0.30 s overlap; $\geq$60% of shorter track; median distance $\leq$1.5 m; heading cosine $\geq$0.95	Handles short noisy tracks without loosening the main group rule
Group diameter	80th-percentile diameter $\leq$3.0 m	Prevents large loose clusters from becoming one companion group

Table 10.4: Companion-grouping criteria

These thresholds were calibrated by hand against labeled pedestrian-group clips drawn from the

same camera feeds, and tightened through manual review until they reproduced clear cases of companion walking without merging people who were merely passing nearby.

Once groups are assigned, we assume tracks that belong to the same group have a base level of familiarity equivalent to Granovetter's strong or weak ties. This is a measurement assumption: the footage can suggest companion walking, but it cannot verify actual relationships. We then treat everyone outside a person's own group as an invisible tie, a term we used before to describe a copresent stranger. For the purposes of our investigation, we are mostly concerned with the copresence among these invisible ties.

10.3.2 Invisible-tie copresence intensity

The analysis then measures invisible-tie copresence intensity: copresence intensity from everyone outside a person's companion group. For solo pedestrians, this is the same as regular copresence intensity because everyone else in the space is outside their group. For groups of two or more, it prevents companions from inflating each other's score.

For each solo pedestrian in each frame, this copresence intensity is computed from nearby people outside that pedestrian's companion group. A nearby person contributes full weight within 1.5 meters, no weight beyond 50 meters, and an exponential falloff between those distances. Relative orientation and the other person's own group size adjust that distance calculation: a person in front keeps the measured distance, one to the side is treated as farther away, one behind is treated as farther still, and a nearby person who is part of a dyad or larger group receives a small group-size multiplier. In compact form:

$$I_i(t) = \min\left(1, \sum_{j \in S_i(t)} w_d(d_{ij} m_o(i,j))\, s_g(j)\right)$$

Term	Value	Meaning
$S_i(t)$	People outside solo pedestrian i's companion group at frame t	Invisible ties around the solo pedestrian
$w_d(d)$	1 within 1.5 m; 0 beyond 50 m; $e^{-d/12}$ between	Distance-decay weight. The cutoffs are pragmatic: 1.5 m marks very close copresence, 50 m is the hard visual cutoff, and the 12 m scale makes nearby people matter much more than distant people without making intensity disappear immediately
$m_o(i, j)$	Front: 1.0; side or unknown: 1.2; behind: 1.5	Effective-distance penalty for relative orientation. Because it multiplies distance before applying w_d, a pedestrian behind the focal person contributes less than an otherwise identical pedestrian in front
$s_g(j)$	$\min(1.3,\ 1.0 + 0.1(\text{group size}_j - 1))$	Small adjustment for nearby people who are themselves part of a dyad or larger group
$\min(1, \cdot)$	Upper bound of 1	Caps the summed score so intensity stays between 0 and 1

Table 10.5: Copresence intensity terms

We cap the metric to signal how we imagine copresence intensity to work in real life: at some point, adding more people does not meaningfully change the intensity of the experience for a given individual.

10.3.3 Solo copresence categories

Each solo pedestrian moment is assigned to one of four descriptive states based on who else is present within the analysis zone.

Alone. No one outside the companion group is within 50 meters. Being alone outside the home may be more reparative for loneliness than being isolated at home, and the possibility of seeing others may still matter. But being alone is the weakest form of non-isolation: it does not create copresence or opportunities for social connection (Nguyen et al., 2018; Heu and Brennecke, 2023).

Co-alone. Exactly one invisible tie is within 50 meters, and the overall copresence intensity stays moderate. This is the thinnest social case: one invisible tie is present, but there is no larger group of people nearby. That barely counts as company, and civil inattention does not work the same way it does in crowds. A single nearby stranger can feel watchful or threatening rather than companionable (Goffman, 1963; Cacioppo and Hawkley, 2009).

Low-ambient. Multiple people outside the companion group are nearby, but the overall copresence intensity stays moderate. This is the strongest candidate for loneliness-relevant public benefit. It de-

scribes enough invisible-tie copresence to create conditions for civil inattention and future familiar-stranger recognition, without the crowding of denser scenes (Goffman, 1963; Milgram, 1977). It is the form of copresence where a person is not socially engaged, but still has the opportunity for relief that comes from being around other people.

High-ambient. The intensity score is at or above the high-ambient threshold. This marks dense invisible-tie copresence around a solo pedestrian. It may be enlivening, and dense scenes have long been valued in public-life observation. But density can also overload attention and become stressful rather than companionable (Whyte, 1980; Simmel, 1903).

The categories are assigned in order: a moment with no nearby invisible ties is alone, regardless of intensity; otherwise, a moment at or above the high-ambient threshold is high-ambient; the remaining moments split into co-alone (exactly one nearby invisible tie) and low-ambient (multiple). This means two people passing each other may be co-alone for most of the encounter, but high-ambient at the closest moment.

The high-ambient threshold is set at a copresence intensity of 0.85. This value is near the median for observed ambient copresence moments, but it is a pragmatic shared threshold, not a boundary grounded in any specific theory or observation. Its purpose is to create a consistent distinction that can be compared across the two spaces. As we better understand these types of copresence, we may choose to draw this boundary differently.

10.4 Limits

10.4.1 Coverage

CCTV camera feeds are hard to record continuously over long periods. Recording quality and coverage had to be balanced against storage limits. Usable footage from the two public spaces runs from the morning of April 12, 2026, to the end of May 10, 2026, Korea time.

Within that period, some days have recording gaps. The main gap runs from April 20 to April 23, 2026, with both sites missing footage during those days and resuming on April 24.

More details on recording coverage are available at copresencecity.com.

10.4.2 Visibility

This pipeline only sees what is visible in each 10-second clip. It cannot measure feeling or inner state. It does not measure the interaction dimension of our copresence grammar. With longer clips, more detail, and audio we could understand a lot more, but for this analysis we assume no out-of-group

interactions. It cannot follow sustained interaction beyond the clip, and it does not link people across days, so each clip is independent. The top-down camera angles also mean faces are not recoverable. That rules out demographic estimation and builds anonymization into the footage.

The grouping algorithm was calibrated through manual review, but it has not been tested against separate ground-truth companion-group labels. Group assignment should therefore be treated as an informed measurement choice, not a confirmed account of actual relationships.

The comparison also rests on two sites, which limits any causal claim. Each camera's field of view and each analysis zone cut off part of the larger copresence environment. Some encounters are therefore truncated by geometry. Here, "alone" means alone within the analysis zone: if only one person appears inside that zone, that person is counted as solo, even if a companion is just outside it.

For that reason, even if the pipeline has reasonable precision and recall, it will systematically underestimate the number of people actually nearby. We treat that asymmetry as known and accepted, and the findings should be read with that limit in mind.

10.4.3 Generalizability

We look at two spaces that have significant design similarities (both are walk and bike paths near streams adjacent to roads), but are located in different South Korean cities and different types of neighborhoods.

For that reason, the results should be read as a first test of what this method can make visible, not as a general account of Korean stream-side paths or loneliness in public space. The two sites are enough to compare how similar walking corridors produce different copresence patterns, and to show where CCTV-based observation can begin to support more systematic questions. The findings are meant to describe what solo walking looked like in these two spaces during this window, and what those patterns suggest for future measurement.

Chapter 11

Walking Alone

Supplementary figures and per-clip data for the analyses in this chapter are available at copresencecity.com.

11.1 Neighborhood context

Seongsan and Oncheoncheon sit in different neighborhood contexts. We can see this in the administrative districts that make up the main 500 meter catchment around each site anchor. Around Seongsan, that catchment is mostly Seongsan 2-dong, Mangwon 2-dong, and Seongsan 1-dong. Around Oncheoncheon, the catchment is made up mostly of Sumin-dong and Geoje 1-dong.

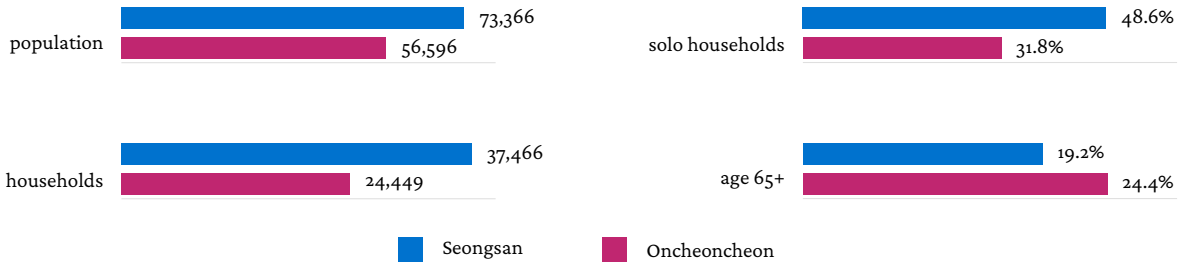


Figure 11.1: 500 meter catchment context for the two spaces (Ministry of the Interior and Safety, Republic of Korea, 2026)

These differences give the immediate neighborhood around each camera a different demographic baseline.

Both sites are also embedded in much larger transit sheds. A rough transit-feed and population check puts the 30-minute walk-and-transit catchment on the order of one million residents: about 1.1 mil-

lion for Seongsan and 0.9 million for Oncheoncheon (Digital Twin Urban Mobility, 2026; OpenStreetMap contributors, 2026; Ministry of the Interior and Safety, Republic of Korea, 2026).

11.2 Who Goes There

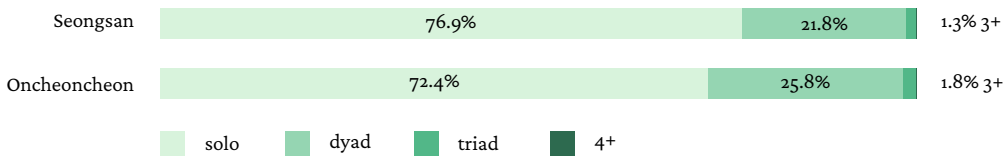


Figure 11.2: Observed pedestrian share by group size

The observed pedestrian share is 76.9% solo at Seongsan and 72.4% solo at Oncheoncheon, with the rest mostly pairs and a small tail of larger groups.

That pattern holds despite very different overall headcounts: Seongsan averages about 1.0 people in the analysis zone at any moment, while Oncheoncheon averages about 1.9. In both spaces, the most common user is still the solo walker.

Seongsan Oncheoncheon

Figure 11.3: Solo walkers

11.3 Presence elasticity

Most people present in each space are there solo. We can ask whether solos show up at a steady rate or vary the way dyads and triads do.

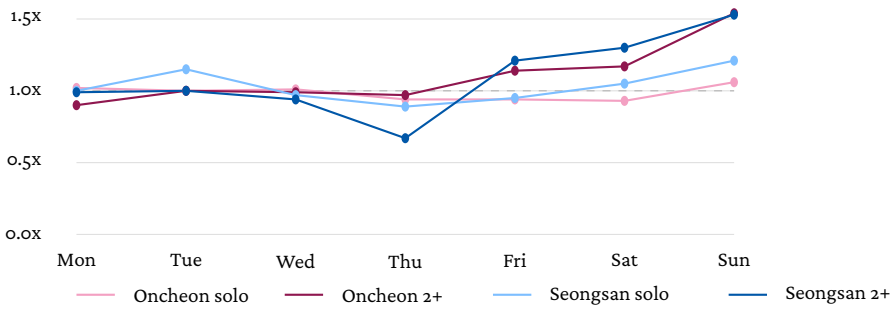


Figure 11.4: Relative weekly cadence by group size

11.3.1 Time

From the weekly cadence we can see that solos show up quite consistently day to day, with a small weekend bump. Groups of 2 or more, however, show up much more on weekends, rising to about 50% above the median weekday rate on Sunday.

There are far more solo walkers overall, so a small relative bump still means many more solos are showing up on weekends. But we can see initial evidence here that the solo rate may be less elastic day-to-day than the rate for groups of two or more.

11.3.2 Weather

Seoul and Busan are in very different parts of the country, and it would be prudent to understand what the impact of weather and climate might be on the presence of people in the two spaces.

The temperature bins below use fixed two-degree Celsius intervals, reused across both sites. This keeps the comparison easy to read while avoiding the sparse tails that would come from one-degree bins.

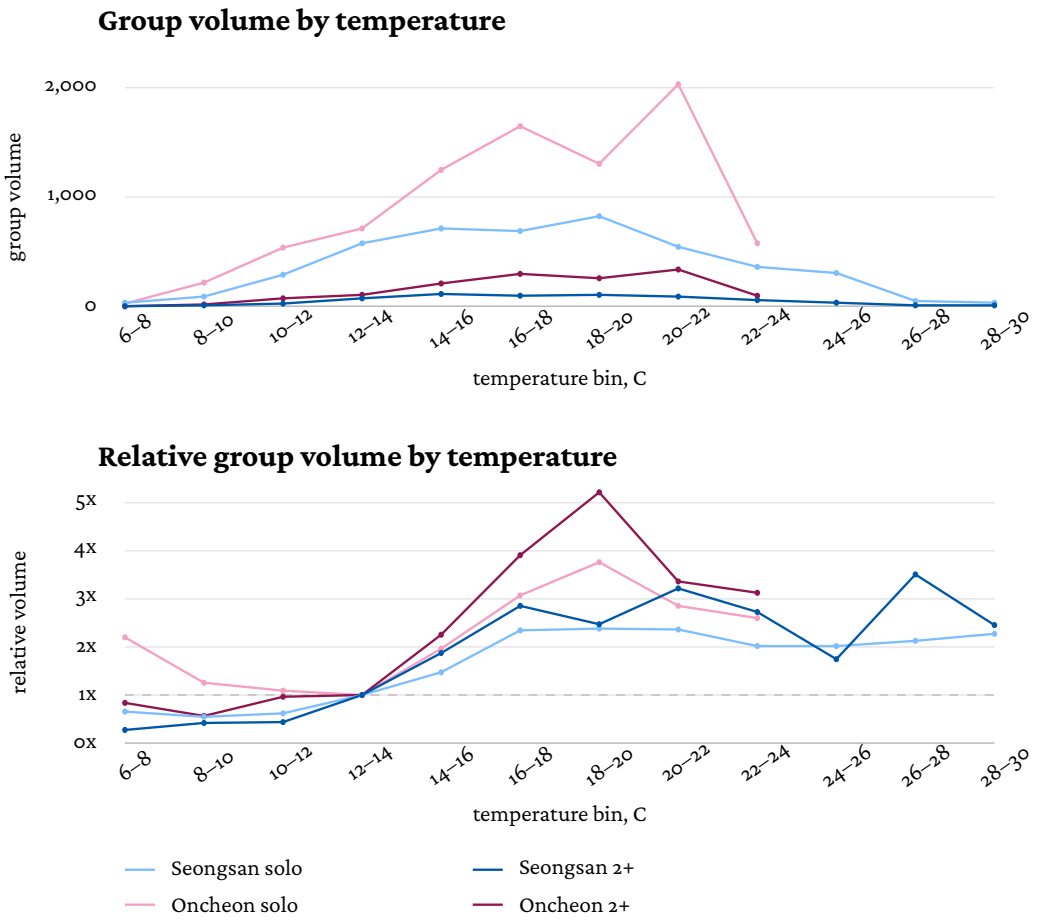


Figure 11.5: Group presence variation by temperature

As we would expect, weather does correlate with whether people show up.

When we compare observations within the same temperature ranges, we still see different behavior in the two spaces: Oncheoncheon brings out more solos and groups at most temperatures. We also see evidence that warmer temperatures are associated with more groups, but that response appears stronger for groups of 2 or more than for solos.

11.3.3 Demand

We use a simple demand model as a check on how much of the variation of who shows up can be explained by weather, place, and daily rhythm.

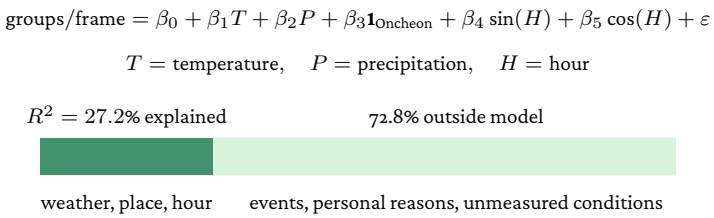


Figure 11.6: Simple demand model for group presence

This is evidence that time, weather, and broad site identity explain about 27% of the variation in how many groups show up. The remaining variation is not explained by this simple model. Some of it may come from events, personal reasons, unmeasured conditions, and more specific city-shaped factors.

11.4 Forms of copresence

11.4.1 Distribution

Seongsan and Oncheoncheon produce very different solo copresence profiles. Seongsan has more alone and co-alone time. Oncheoncheon has more ambient copresence, especially the low-ambient form we treat as the strongest candidate for reducing loneliness.

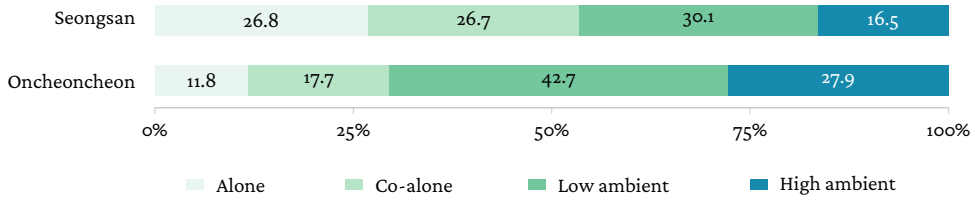


Figure 11.7: Frequency of the four categories of solo copresence

27% of solo copresence moments in Seongsan are alone moments, with no measured strangers within 50 meters. In Oncheoncheon, this only occurs 12% of the time. A random solo moment in Oncheoncheon is 43% likely to be low ambient, compared to 30% in Seongsan.

Far more people live within Seongsan's catchment area in solo households. We cannot say if this is what explains the higher share of alone moments in Seongsan. There is also a higher volume of visitors to Oncheoncheon, which may account for much of the difference in the copresence profiles of the two spaces.

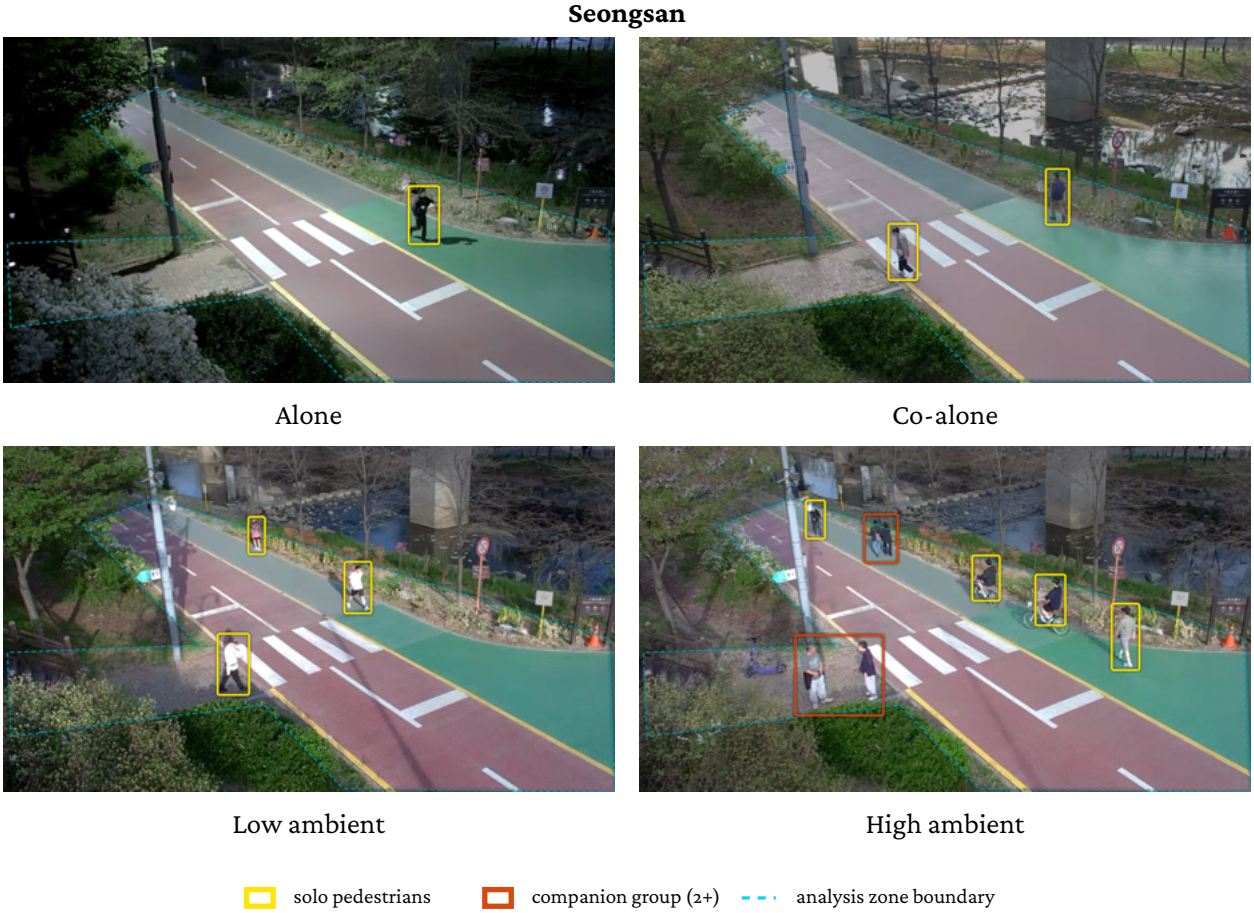


Figure 11.8: Seongsan example frames for the four solo copresence categories

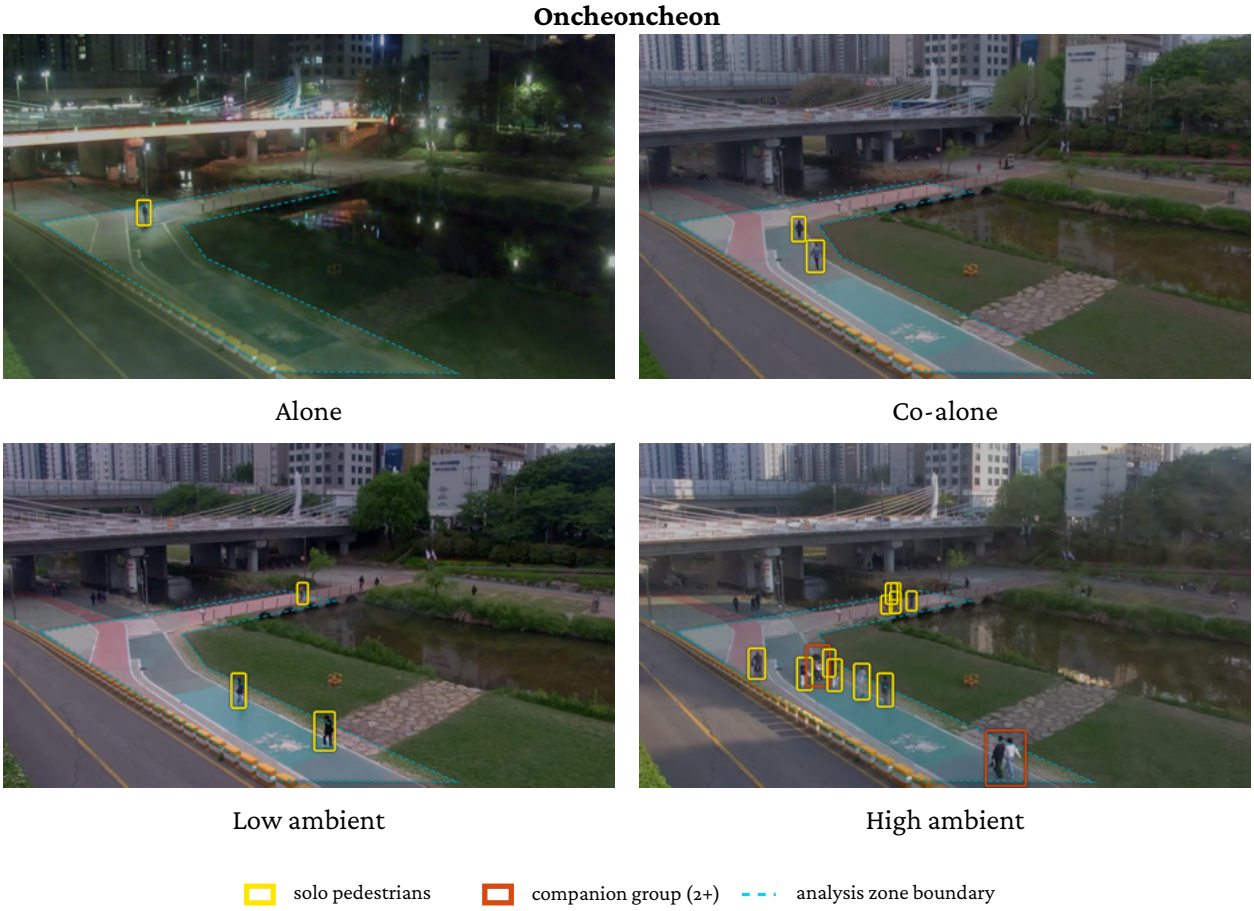


Figure 11.9: Oncheoncheon example frames for the four solo copresence categories

11.4.2 Crowds

To compare quiet and busy moments, we group clips by headcount density, the average number of people in the analysis zone per 100 m².

As density rises, group pedestrians make up a larger observed pedestrian share. At Oncheoncheon, the observed share of pedestrians in groups of two or more rises from 0.8% in the quietest shared bin to 36.4% in the densest bin. At Seongsan, it rises from 0 to 42.7%. Crowded moments are more filled with groups than quiet moments.

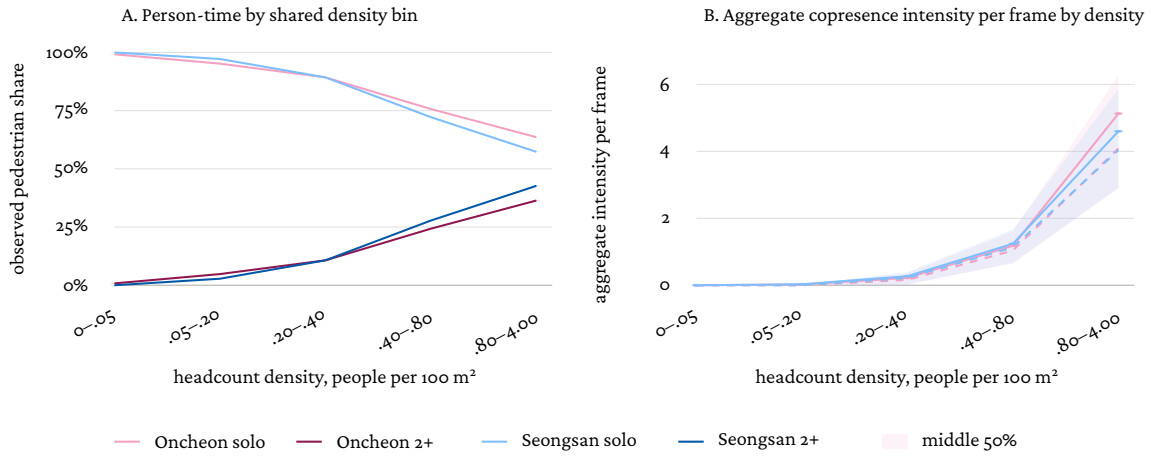
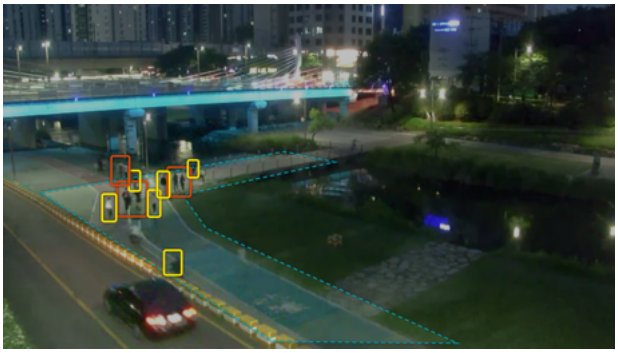


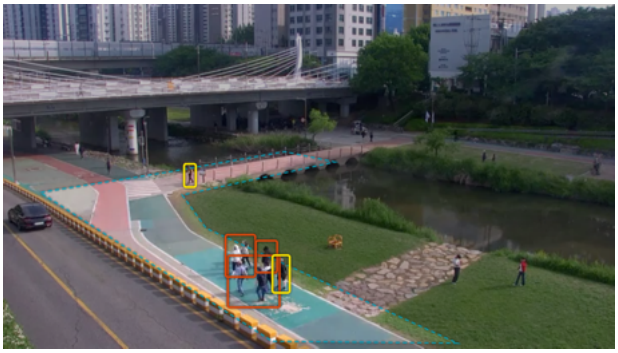
Figure 11.10: Crowds and copresence

When we look at the relationship of crowds to aggregate copresence intensity, headcount density is the simplest correlation: density alone accounts for 74.7% of the observed variation.

But density does not determine intensity by itself. How people are distributed around the space also matters.



High density, higher copresence intensity for solos



High density, lower copresence intensity for solos

Figure 11.11: Two Oncheoncheon moments with similar density but different aggregate copresence intensity

This suggests that our design goal should not only be how many people a space attracts, but how those people are distributed within it.

11.4.3 Lingering

Because we only use 10 second clips, we cannot determine real lingering patterns. But we can measure solo-pedestrian pace within those clips, classify solo tracks faster than 3.0 m/s as bicycles and

exclude them, and treat lower mean walking speeds as suggestive evidence of slower, less hurried movement.

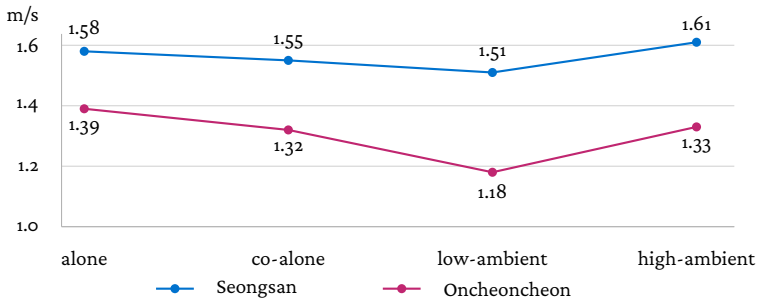


Figure 11.12: Mean solo-pedestrian walking pace by solo copresence moment category

We can see that Seongsan has faster speeds overall. Maybe the elderly population around Oncheoncheon is a factor, or maybe Seongsan is used more by runners.

We see an interesting dip in mean solo-pedestrian pace at low ambient copresence in both spaces. Slow bikes may be detected as people at certain intensities, or there may be a bias for slower people at the hours when low ambient is most present. It is also possible that solo pedestrians move more slowly in low ambient settings because they are more comfortable watching, noticing, or moving without hurry.

If low ambient copresence is the category most likely to help with loneliness, it makes sense to ask whether it is also the category where solo pedestrians feel more comfortable and move more slowly.

This does not show lingering directly. But it does make us wonder if low ambient copresence is associated with slower solo movement, and whether that association would hold in longer observations of dwell time. If so, it would matter for designing and programming public spaces for comfort, copresence, and reducing loneliness.

11.5 Next

Recording five-minute or longer clips would make it possible to separate walking pace from dwell time, observe short interactions, and test whether low ambient copresence is actually associated with lingering.

A comparison across more spaces and longer time windows would also add to the findings here. Given the hundreds of CCTV camera feeds available in South Korea, there may be discoverable correlations between observable copresence dynamics, neighborhood context, and the design of public spaces.

Pairing this visual analysis with surveys of participants in the space would allow us to say more about how the different types of copresence make people feel, and what the promise might be for reducing loneliness when we bring people into public spaces.

A natural next step would be to find a CCTV feed covering a space with an intervention, such as added seating, programming, or activities, and compare it with a control to see the impact on copresence, group presence, and dwell time.

Together, these directions would help cities see not just how many people use a public space, but what kinds of copresence it supports.

Part IV

A Purpose for Cities

Chapter 12

Principles for Copresence

Copresence is a defense against loneliness. Cities and their shared spaces are the medium in which we experience copresence. Cities must embrace their role as a provider and designer of copresence.

The grammar we have built gives cities a way to think about copresence as something to design for. As research continues, we will learn which forms of copresence leave people feeling more connected and socially fulfilled. We hope that cities will be able to measure and design for copresence the way they do for other municipal services and priorities like transportation, stormwater drainage, or employment.

While we hope this grammar and analysis bring us closer to the future where we can measure copresence in cities, there are principles that we believe will help create more positive copresence today, and cities can act on them. Some of these principles are well-established, some are adaptations of existing planning concepts, and they deserve a closer look from the urban planning community as cities consider how to combat loneliness.

A copresence-oriented city should not only bring people into public space, but make low-pressure ambient copresence easier to experience in ordinary daily life.

Perhaps, four P's of designing for copresence.

12.1 Pacing

Cities should use proximity and transit to encourage trips of varying lengths.

Cities need to intentionally pace and distribute the proximities and movement of people. This might also be called the 5/15/45 minute city.

The five-minute reach should hold services and amenities that make leaving home easy, so the smallest trips happen often. We need reasons to leave home that are right around the corner to minimize the tendency to isolate.

The 15-minute neighborhood should provide the most important daily services (Moreno et al., 2021). This is the scale at which we can have a richer, neighborhood-scale community where a sense of belonging can take hold. Both five-minute block amenities and 15-minute neighborhoods are prime spaces for familiar strangers.

The 45-minute regional reach should give residents access to diverse amenities and reasons to visit new neighborhoods. This gives people a reason to avoid the socially isolating car and mix with others in transit and in neighborhoods they do not normally visit.

Each scale serves a different copresence function: easy exit from home, neighborhood familiarity, and cross-neighborhood mixing.

12.2 Porosity

Cities should use architecture and placemaking to provide gradients of exposure to public life.

Walter Benjamin and Asja Lacis, watching daily life in Naples, used *porosity* to describe the way the boundary between private and public stayed soft (Benjamin and Lacis, 1978). Rooms opened onto courtyards, courtyards onto streets.

Without a home, there is no porosity to design. The primary obligation of any city is to provide everyone, including those who may be unhoused, a space to be alone.

Cities must then think of the space between home life and public life as a gradient. People should be given the opportunity to avoid isolation in the lightest way possible. This requires considering the design of buildings and their shared, perhaps publicly accessible spaces, as well as the balconies, stoops, sidewalks, and windows of private homes. Understanding where pedestrians flow matters here too.

While privacy is important, good porous design can encourage moments of copresence: one can imagine the shared mailbox or the path to the parking deck.

A porous city makes it easy to intermittently experience a minimal amount of copresence from others.

12.3 Palaces

Cities should use public funds to provide accessible third places people want to go to.

Klinenberg's *Palaces for the People* names civic infrastructure that hosts the public for free (Klinenberg, 2018). We use palaces to describe the high-quality, publicly accessible third places cities should be providing, the kinds of public third places that people want to go to.

We should resist the slow privatization of the third place, where the right to sit down in the presence of others requires a purchase. The city needs to build palaces to attract people into public life.

Whether libraries, community centers, or some new model of public venue, cities should treat these palaces as priority infrastructure and build them the way they build sewers.

12.4 Play

Cities should use programming and spectacle to make daily life worth wandering through.

Debord called the dérive a walk through the city for its own sake (Debord, 2006). Play widens this idea to include the block party, the art installation, the children at the playground, and the serendipities that make a random walk worth taking.

We should not think of the public realm as merely connective tissue between functional destinations, but as a place to be in and of itself. Cities should make the experience of being in public attractive, engaging, fun, and joyful.

We might call the city that focuses on these experiences in addition to its traditional services and functions the *Experiential City*.

Chapter 13

The Experiential City

The *Experiential City* is the city built on these four principles. Pacing, porosity, palaces, and play give cities a way to treat copresence as infrastructure, alongside the water and transit and waste systems they already manage. We do not need to invent it from scratch. Pieces of it already exist in cities around the world, and other ideas are waiting to be tried.

13.1 Today

The principles we champion here are not new, and they already are a part of the way we think about planning. We can see examples of real infrastructure that works along our principles, both community-built and city-provided.

Nairobi matatus: Pacing. The dense, demand-responsive minibus network carries the majority of Nairobi's commuters as an informal transit system. The vehicles function as sites of class mixing, music, and political talk, making the trip a hub for copresence (Mutongi, 2017).

De Hogeweyk, Weesp: Porosity. The Dutch dementia village organizes its houses around internal streets, a plaza, and a small commercial spine, with no locked doors between dwellings and shared streets in daily use. The gradient between dwelling and shared space stays soft throughout (Sturge, 2024).

Tokyo sentō: Palaces. Neighborhood public bathhouses, price-capped by prefectural governors under Japan's Public Bath House Act of 1948, functioned for decades as the informal gathering rooms of dense residential wards. That network has been shrinking sharply: Tokyo counted over 2,600 at their peak in the late 1960s and roughly 430 by 2024 (Tokyo Metropolitan Government, 2024).

Marrakech Jemaa el-Fnaa: Play. The square at the entrance to the medina hosts commerce by day and storytellers, musicians, performers, and food stalls by night. UNESCO listed the site in 2008 for this practice (UNESCO, 2008).

The Experiential City already exists in fragments around the world. Cities should now make it intentional.

13.2 Possible Tomorrows

We can apply these principles to propose policies that make copresence a civic priority.

13.2.1 Shared Cabinets and Small Fridges

So much of the space in our homes is used for storage. This is both an inefficiency for dense housing and an opportunity for creating targeted copresence. We can imagine reducing the sizes of refrigerators and kitchen cabinets and providing every residence access to a 24-hour micro grocery store on their block.

This would generate many more quick trips outside the home and the related opportunities for moments of copresence and relating with neighbors. This is an example of intentionally designing for friction in service of well-being.

This pattern already exists in some places. Tokyo's conbini sit at near-residential density and stay open around the clock, and New York bodegas play a similar role at the corner of nearly every block.

The economics of this would need further refinement to make viable. But it is this kind of block-level copresence that is needed to reduce the deepest forms of isolation.

13.2.2 Palace Mixing

Wealthy neighborhoods are often the ones getting nice things. But we want all neighborhoods to have access to quality public infrastructure and for residents to leave their own neighborhoods occasionally. A municipality should pool a portion of its public-realm budget and direct funding from better-resourced neighborhoods to under-resourced ones. The city should use that funding to build amenities or third places that would attract residents from other neighborhoods.

There are some precedents to this kind of model. Texas school finance equalization redistributes property-tax revenue between rich and poor districts (Texas Legislature, 2019). Germany's Länderfinanzausgleich does the same between states (German Federal Ministry of Finance, 2020). Participatory budgeting, in its strongest forms, hands a chunk of the capital plan to residents (Cabannes, 2004). But none have done redistribution focused on public-realm and third-place investment across neighborhoods.

The goal would be to create truly polycentric cities by design and with financial backing. Whether this financial redistribution is directed towards palaces for the public, or to incentivize certain forms of private sector development, this would be an opportunity to create demand for longer transit trips and copresence across communities.

This policy would require testing (and courage). Gentrification is a significant problem in many neighborhoods. In theory, providing nicer amenities to poorer, non-gentrifying neighborhoods could help to slow gentrification elsewhere in the city and distribute demand across neighborhoods more evenly. But this would need to be studied further.

13.2.3 Theater of the City

Can we make being in the city as entertaining as watching a show on TV? Cities should consider how to make leaving home not just a means to a functional errand, but a joyful, attractive experience of its own.

Public art and cultural programming aim to do this, but their funding has historically been insufficient and the scale at which they can work is limited. But new buildings are frequently built, businesses are trying to attract customers, and local artists are always seeking out new projects.

Connected experiences across third places and public spaces can use storytelling and art to give residents a reason to keep coming back. Maybe a new story unfolds across all the businesses in a block every three months. Maybe a digital tool turns discovering the city into a game where neighborhoods compete.

The point is not to make cities into theme parks. Disneyland and Meow Wolf are privatized, ticketed, and scripted, which a public realm cannot be. But cities can study how they create narrative, reasons to return, and a sense of awe, and find ways to make the experience of being in a city more joyful and playful. Urban design, public art, and cultural programming deserve to be brought together to build more joyful urban environments that make residents want to leave home just to see what story they'll discover today.

13.3 Loneliness in Planning

To begin acting on these principles, cities should take one concrete action today: create a role for a staff planner focused on the loneliness and social life of its residents.

The planner should begin to understand the progression of the loneliness epidemic in the city and profile the neighborhoods that have effective spaces for engaged and ambient copresence. This planner should advocate for loneliness to be a priority across departments and begin community engagement efforts focused on loneliness and social well-being.

These principles concentrate on what cities can build and program to make leaving home more likely, but there are other levers too. Regulatory and fiscal ones, from parking minimums to zoning defaults to the tax treatment of home delivery, also shape whether daily life pulls people out or keeps them in. A loneliness-focused planner or policy maker should consider all of these, with attention to who each lever falls on. Loneliness and isolation are a health condition, and policies that penalize people for staying home can deepen the harm they mean to address.

National governments have begun to understand the importance of this and create loneliness-focused roles. The United Kingdom appointed a Loneliness Minister in 2018 (HM Government, 2018). Japan opened a corresponding office in 2021 (Cabinet Secretariat of Japan, 2021). But the solution lies in our cities, and they should take on the responsibility.

13.4 A New Purpose

Cities need to adapt. We are retreating into our homes, interacting less with each other, and becoming increasingly lonely. Loneliness is a structural, spatial problem.

Cities already manage water, movement, waste, safety, and land. They should also manage the conditions for feeling connected to others.

The Experiential City accepts that the feelings of its residents are part of its purpose. It cultivates copresence and defends against loneliness. It is time we accept this new purpose for our cities.

Acknowledgments

Thank you to everyone who cared, even a little. It meant a lot.

Fábio Duarte, for helping me walk towards a purpose.

Jim Aloisi, for helping me understand the experiential city.

Danielle Allen, Garnette Cadogan, Nick Montfort, Sherry Turkle, Nathan Wilmer, for expanding the narrative.

Stew Stewart, for encouraging uniqueness.

Andrew, Areen, Carrie, Eddie, Marie, Miguelina, Rachel, Sarah, Tobi, Vivek, friends at DUSP, friends at the Senseable City Lab, for your meaningful copresence.

Calvin Brett, for believing in the theater of the city.

Arman, Monique, for being my strongest ties.

Buket, Metin, for everything.

Bibliography

Cevat Giray Aksoy, Jose Maria Barrero, Nicholas Bloom, Steven J. Davis, Mathias Dolls, and Pablo Zarate. Working from home around the world. Working Paper 30446, National Bureau of Economic Research, 2022.

Gordon W Allport. *The Nature of Prejudice*. Addison-Wesley, Reading, MA, 1954.

Lukas Althoff, Fabian Eckert, Sharat Ganapati, and Conor Walsh. The geography of remote work. *Regional Science and Urban Economics*, 93:103770, 2022. doi:10.1016/j.regsciurbeco.2022.103770.

Benedict Anderson. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Verso, London, revised edition, 2006. ISBN 9781844670864.

Jay Appleton. *The Experience of Landscape*. John Wiley & Sons, London, 1975.

Enghin Atalay. A twenty-first century of solitude? time alone and together in the united states. *Journal of Population Economics*, 37(1), 2024. doi:10.1007/s00148-024-00978-0. URL https://link.springer.com/article/10.1007/s00148-024-00978-0.

Jose Maria Barrero, Nicholas Bloom, and Steven J Davis. The evolution of work from home. *Journal of Economic Perspectives*, 37(4):23–50, 2023. doi:10.1257/jep.37.4.23.

Manuela Barreto, Christina Victor, Claudia Hammond, Alice Eccles, Matt T. Richins, and Pamela Qualter. Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and Individual Differences*, 169:110066, 2021. doi:10.1016/j.paid.2020.110066.

Walter Benjamin and Asja Lacis. Naples. In Peter Demetz, editor, *Reflections: Essays, Aphorisms, Autobiographical Writings*, pages 163–173. Schocken Books, New York, 1978. ISBN 9780805203028.

Yves Cabannes. Participatory budgeting: a significant contribution to participatory democracy. *Environment and Urbanization*, 16(1):27–46, 2004. doi:10.1177/095624780401600104.

Cabinet Secretariat of Japan. Office for the policy on loneliness and isolation, 2021. URL https://www.cao.go.jp/kodoku_koritsu/index-e.html.

John T. Cacioppo and Louise C Hawkley. Perceived social isolation and cognition. *Trends in Cognitive Sciences*, 13(10):447–454, 2009. doi:10.1016/j.tics.2009.06.005.

John T. Cacioppo and William Patrick. *Loneliness: Human Nature and the Need for Social Connection*. W. W. Norton & Company, New York, 2008. ISBN 978-0-393-06170-3.

Garnette Cadogan. Walking while black. *The Fire This Time*, 2016. URL https://lithub.com/walking-while-black/.

Raffaella Calati, Chiara Ferrari, Marie Brittner, Osmano Oasi, Emilie Olié, André F. Carvalho, and Philippe Courtet. Suicidal thoughts and behaviors and social isolation: A narrative review of the literature. *Journal of Affective Disorders*, 245:653–667, 2019. doi:10.1016/j.jad.2018.11.022.

Philip N Cohen. The rise of one-person households. *Socius: Sociological Research for a Dynamic World*, 7:1–3, 2021. doi:10.1177/23780231211062315.

J.S Coleman. Social capital in the creation of human capital. *American Journal of Sociology*, 94: S95–S120, 1988. doi:10.1086/228943. URL https://www.journals.uchicago.edu/doi/abs/10.1086/228943.

Erin York Cornwell and Linda J. Waite. Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, 50(1):31–48, 2009. doi:10.1177/002214650905000103.

Daniel A. Cox. The state of american friendship: Change, challenges, and loss. American perspectives survey, Survey Center on American Life, American Enterprise Institute, June 2021. URL https://www.americansurveycenter.org/research/the-state-of-american-friendship-change-challenges-and-loss/.

Jenny de Jong Gierveld and Theo van Tilburg. A 6-item scale for overall, emotional, and social loneliness: Confirmatory tests on survey data. *Research on Aging*, 28(5):582–598, 2006. doi:10.1177/0164027506289723.

Guy Debord. Theory of the derive. In Ken Knabb, editor, *Situationist International Anthology*, pages 62–66. Bureau of Public Secrets, Berkeley, CA, 2006. ISBN 9780939682041. URL https://www.bopsecrets.org/SI/2.derive.htm.

Patrick Dendorfer, Aljovsa Ovsep, Anton Milan, Konrad Schindler, Daniel Cremers, Ian Reid, Stefan Roth, and Laura Leal-Taix'e. Motchallenge: A benchmark for single-camera multiple target tracking. *International Journal of Computer Vision*, 129:845–881, 2021. doi:10.1007/s11263-020-01393-0.

Digital Twin Urban Mobility. Gtfs korea. Hugging Face dataset, 2026. URL https://huggingface.co/datasets/Digital-Twin-Urban-Mobility/GTFS-Korea. GTFS_Korea.zip; retrieved 2026-05-11.

Amir Forouhar, Karen Chapple, Jeff Allen, Byeonghwa Jeong, and Julia Greenberg. Assessing downtown recovery rates and determinants in north american cities after the covid-19 pandemic. *Urban Studies*, 62(6):1209–1231, 2025. doi:10.1177/00420980241270987.

Sheila Foster and Christian Iaione. The city as a commons. *Yale Law & Policy Review*, 34(2):281–349, 2016. URL https://yalelawandpolicy.org/city-commons.

Jan Gehl. *Life Between Buildings: Using Public Space*. Van Nostrand Reinhold, New York, 1987.

German Federal Ministry of Finance. Fiscal equalization between the federal government and the Länder (Länderfinanzausgleich). Federal Ministry of Finance, Germany, 2020. URL https://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Topics/Fiscal_policy/Federal_budget/fiscal-equalisation-between-federal-government-and-laender.html.

E Goffman. *Behavior in Public Places: Notes on the Social Organization of Gatherings*. Free Press, New York, 1963. ISBN 9780029119303.

Seoul Metropolitan Government. Seoul without loneliness initiative. City Policy Programme, announced October 2024, 2024. URL https://english.seoul.go.kr/seoul-policy-archive/seoul-without-loneliness/.

M.S Granovetter. The strength of weak ties. *American Journal of Sociology*, 78(6):1360–1380, 1973. doi:10.1086/225469. URL https://www.journals.uchicago.edu/doi/abs/10.1086/225469.

Jürgen Habermas. *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*. MIT Press, Cambridge, MA, 1989. ISBN 9780262081801.

Garrett Hardin. The tragedy of the commons. *Science*, 162(3859):1243–1248, 1968. doi:10.1126/science.162.3859.1243.

Louise C. Hawkley and John T Cacioppo. Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, 40(2):218–227, 2010. doi:10.1007/s12160-010-9210-8.

Kanxuan He, Haoxuan Li, Huanjia Zhang, Qinru Hu, Yaoze Yu, and Waishan Qiu. Revisiting gehl's urban design principles with computer vision and webcam data. *Environment and Planning B: Urban Analytics and City Science*, 2026. doi:10.1177/23998083251328771. URL https://journals.sagepub.com/doi/10.1177/23998083251328771.

L.C. Heu and T Brennecke. By yourself, yet not alone: Making space for loneliness. *Urban Studies*, 60(16):3187–3197, 2023. doi:10.1177/00420980231169669.

HM Government. A connected society: a strategy for tackling loneliness — laying the foundations for change, 2018. URL https://www.gov.uk/government/publications/a-connected-society-a-strategy-for-tackling-loneliness.

J. Holt-Lunstad, T.B. Smith, and J.B. Layton. Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, 7(7)(7):e1000316, 2010. doi:10.1371/journal.pmed.1000316. URL https://doi.org/10.1371/journal.pmed.1000316.

Julianne Holt-Lunstad and Carla Perissinotto. Social isolation and loneliness as medical issues. *New England Journal of Medicine*, 388(3):193–195, 2023. doi:10.1056/NEJMp2208029.

Julianne Holt-Lunstad, Timothy B. Smith, Mark Baker, Tyler Harris, and David Stephenson. Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science*, 10(2):227–237, 2015. doi:10.1177/1745691614568352.

Julianne Holt-Lunstad, Theodore F. Robles, and David A. Sbarra. Advancing social connection as a public health priority in the united states. *American Psychologist*, 72(6):517–530, 2017. doi:10.1037/amp0000103.

Melissa G. Hunt, Rachel Marx, Courtney Lipson, and Jordyn Young. No more fomo: Limiting social media decreases loneliness and depression. *Journal of Social and Clinical Psychology*, 37(10):751–768, 2018. doi:10.1521/jscp.2018.37.10.751.

James Iveniuk, Lissette M. Piedra, Ashwin Kotwal, Jocelyn Wilder, and Louise Hawkley. How race, gender, and cohort shape social isolation and loneliness in older americans. *Journal of Applied Gerontology*, 2025. doi:10.1177/07334648251360449.

Jane Jacobs. *The Death and Life of Great American Cities*. Random House, New York, 1961. ISBN 9780679741954.

Andrej Karpathy. AutoResearch: Ai agents running research on single-gpu nanochat training automatically. GitHub repository, 2026. URL https://github.com/karpathy/AutoResearch.

A Kendon. *Conducting Interaction: Patterns of Behavior in Focused Encounters*. Number 7 in Studies in Interactional Sociolinguistics. Cambridge University Press, Cambridge, UK, 1990. ISBN 978-0-521-38938-9. URL https://www.cambridge.org/9780521389389.

Rahima Khanam and Muhammad Hussain. Yolov11: An overview of the key architectural enhancements, 2024. URL https://arxiv.org/abs/2410.17725.

Eric Klinenberg. *Going Solo: The Extraordinary Rise and Surprising Appeal of Living Alone*. Penguin Press, New York, 2012. ISBN 9781594203220.

Eric Klinenberg. *Palaces for the People: How Social Infrastructure Can Help Fight Inequality, Polarization, and the Decline of Civic Life*. Crown, New York, 2018. ISBN 9781524761165.

Robert Kraut, Michael Patterson, Vicki Lundmark, Sara Kiesler, Tridas Mukophadhyay, and William Scherlis. Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, 53(9):1017–1031, 1998. doi:10.1037/0003-066X.53.9.1017.

J. Lee et al. Loneliness and suicidality in korea. *JKMS*, 38(36):e287, 2023. doi:10.3346/jkms.2023.38.e287.

Nicholas Leigh-Hunt, David Bagguley, Kamlesh Bash, Victoria Turner, Sophie Turnbull, Nicole Valtorta, and Woody Caan. An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health*, 152:157–171, 2017. doi:10.1016/j.puhe.2017.07.035.

Lyn H Lofland. *A World of Strangers: Order and Action in Urban Public Space*. Basic Books, New York, 1973.

Martina Luchetti, Damaris Aschwanden, Amanda A. Sesker, Xianghe Zhu, Páraic S. O'Súilleabháin, Yannick Stephan, Antonio Terracciano, and Angelina R. Sutin. A meta-analysis of loneliness and risk of dementia using longitudinal data from >600,000 individuals. *Nature Mental Health*, 2(11):1350–1361, 2024. doi:10.1038/s44220-024-00328-9. URL https://doi.org/10.1038/s44220-024-00328-9.

Jonathon Luiten, Aljosa Osep, Patrick Dendorfer, Philip H. S. Torr, Andreas Geiger, Laura Leal-Taixé, and Bastian Leibe. Hota: A higher order metric for evaluating multi-object tracking. *International Journal of Computer Vision*, 129(2):548–578, 2021. doi:10.1007/s11263-020-01375-2.

Miller McPherson, Lynn Smith-Lovin, and Matthew E. Brashears. Social isolation in america: Changes in core discussion networks over two decades. *American Sociological Review*, 71(3): 353–375, 2006. doi:10.1177/000312240607100301.

Vikas Mehta. *The Street: A Quintessential Social Public Space*. Routledge, New York, 2013. doi:10.4324/9780203067635. URL https://www.taylorfrancis.com/books/mono/10.4324/9780203067635/street-vikas-mehta.

Stanley Milgram. The familiar stranger: An aspect of urban anonymity. In *The Individual in a Social World*, pages 51–53. Addison-Wesley, Reading, MA, 1977.

Ministry of Health and Welfare. Survey on extreme social withdrawal among young adults. Research report, Korea Institute for Health and Social Affairs (KIHASA), 2023. URL https://www.mohw.go.kr/board.es?mid=a10503000000&bid=0027&list_no=1479278&act=view.

Ministry of Health and Welfare. Lonely deaths statistics 2023. Government report, Ministry of Health and Welfare, 2024. URL https://www.mohw.go.kr/board.es?mid=a10503010100&bid=0027&act=view&list_no=1483372.

Ministry of Health and Welfare, Republic of Korea. 2023 survey on the actual conditions of the elderly (2023년 노인실태조사). National Survey, Korea Institute for Health and Social Affairs (KIHASA) for MOHW, 2024. URL https://www.mohw.go.kr/board.es?act=view&bid=0019&list_no=1483359&mid=a10411010300.

Ministry of the Interior and Safety, Republic of Korea. 지역별(행정동) 성별 연령별 주민등록 인구수 및 세대원수별 주민등록 세대수 [resident registration population and household counts by administrative dong]. Public data files, data.go.kr, 2026. URL https://www.data.go.kr/data/15097972/fileData.do. Datasets used: 행정안전부_지역별(행정동) 성별 연령별 주민등록 인구수 and 행정안전부_지역별(행정동) 세대원수별 주민등록 세대수; reference month 2026-04-30; retrieved 2026-05-11. Household dataset URL: https://www.data.go.kr/data/15097974/fileData.do.

Daa Un Moon, Hyewon Kim, Jin-Hyung Jung, Kyungdo Han, and Hong Jin Jeon. Suicide risk and living alone with depression or anxiety. *JAMA Network Open*, 8(3):e251227, 2025. doi:10.1001/jamanetworkopen.2025.1227. URL https://doi.org/10.1001/jamanetworkopen.2025.1227.

Carlos Moreno, Zaheer Allam, Didier Chabaud, Catherine Gall, and Florent Pratlong. Introducing the 15-minute city: Sustainability, resilience and place identity in future post-pandemic cities. *Smart Cities*, 4(1):93–111, 2021. doi:10.3390/smartcities4010006. URL https://www.mdpi.com/2624-6511/4/1/6.

Kenda Mutongi. *Matatu: A History of Popular Transportation in Nairobi*. University of Chicago Press, Chicago, 2017. ISBN 9780226130866. doi:10.7208/chicago/9780226471426.001.0001.

Mohammad Nasri, Theodoros Maliappis, Carolien Rieffe, and Mitra Baratchi. T-dante: Detecting group behaviour in spatio-temporal trajectories using context information. In *Advances in Intelligent Data Analysis XXII (IDA 2024)*, volume 14642 of *Lecture Notes in Computer Science*, pages 28–39. Springer, 2024. doi:10.1007/978-3-031-58553-1_3. URL https://link.springer.com/chapter/10.1007/978-3-031-58553-1_3.

National Academies of Sciences, Engineering, and Medicine. *Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System*. The National Academies Press, Washington, DC, 2020. doi:10.17226/25663.

Thuy-vy T. Nguyen, Richard M. Ryan, and Edward L Deci. Solitude as an approach to affective self-regulation. *Personality and Social Psychology Bulletin*, 44(1):92–106, 2018. doi:10.1177/0146167217733073.

OECD. Affordable housing database: HM1.4 living arrangements by age groups. OECD Affordable Housing Database, latest available data 2022, 2024. URL https://www.oecd.org/content/dam/oecd/en/data/datasets/affordable-housing-database/hm1-4-living-arrangements-age-groups.pdf.

OECD. Health at a glance 2025. OECD Publishing, Paris, 2025.

Office of the U.S. Surgeon General. Our epidemic of loneliness and isolation: The u.s. surgeon general's advisory on the healing effects of social connection and community. Technical report, U.S. Department of Health and Human Services, 2023. URL https://www.hhs.gov/sites/default/files/surgeon-general-social-connection-advisory.pdf.

Ray Oldenburg. *The Great Good Place: Cafés, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts and How They Get You Through the Day*. Paragon House, Saint Paul, MN, 1989. ISBN 9781557781109.

OpenStreetMap contributors. Openstreetmap. Collaborative geographic database, 2026. URL https://www.openstreetmap.org. Administrative dong boundaries retrieved with the Overpass API on 2026-05-11.

Minjin Park and Seong-Ah Kim. Characteristics and types of loneliness, social isolation, and mental health problems in single-person households: Focusing on single-person households in seoul. *Health and Social Welfare Review*, 42(4):127–141, 2022. doi:10.15709/hswr.2022.42.4.127.

Daniel Perlman and Letitia Anne Peplau. Toward a social psychology of loneliness. In Steve Duck and Robin Gilmour, editors, *Personal Relationships in Disorder*, pages 31–56. Academic Press, London, 1981. URL https://peplau.psych.ucla.edu/wp-content/uploads/sites/141/2017/07/Perlman-Peplau-81.pdf.

T.F. Pettigrew and L.R Tropp. A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology*, 90(5):751–783, 2006. doi:10.1037/0022-3514.90.5.751.

Pew Research Center. What the data says about gun deaths in the U.S. https://www.pewresearch.org/short-reads/2025/03/05/what-the-data-says-about-gun-deaths-in-the-us/, March 2025.

Brian A. Primack, Ariel Shensa, Jaime E. Sidani, Erin O. Whaite, Liu Lin, Daniel Rosen, Jason B. Colditz, Ana Radovic, and Elizabeth Miller. Social media use and perceived social isolation among young adults in the u.s. *American Journal of Preventive Medicine*, 53(1):1–8, 2017. doi:10.1016/j.amepre.2017.01.010.

Robert D. Putnam. *Bowling Alone: The Collapse and Revival of American Community*. Simon & Schuster, New York, 2000. ISBN 9780684832838.

Robert D. Putnam and Shaylyn Romney Garrett. *The Upswing: How America Came Together a Century Ago and How We Can Do It Again*. Simon & Schuster, New York, 2020. ISBN 9781982129149.

Yanyan Qi et al. The mere physical presence of another person reduces human autonomic responses to aversive sounds. *Proceedings of the Royal Society B: Biological Sciences*, 287(1919):20192241, 2020. doi:10.1098/rspb.2019.2241.

Republic of Korea. 고독사 예방 및 관리에 관한 법률 [act on the prevention and management of lonely deaths]. National legislation, enacted April 2021, Republic of Korea, 2021.

David Riesman, Nathan Glazer, and Reuel Denney. *The Lonely Crowd: A Study of the Changing American Character*. Yale University Press, New Haven, CT, 1950.

Michael J. Rosenfeld, Reuben J. Thomas, and Sonia Hausen. Disintermediating your friends: How online dating in the united states displaces other ways of meeting. *Proceedings of the National Academy of Sciences*, 116(36):17753–17758, 2019. doi:10.1073/pnas.1908630116.

Alissa Russell, C. S. Bergeman, and Stacey B. Scott. Daily social exchanges and affect in middle and later adulthood: The impact of loneliness and age. *International Journal of Aging and Human Development*, 74(4):299–329, 2012. doi:10.2190/AG.74.4.c.

Daniel W Russell. Ucla loneliness scale (version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, 66(1):20–40, 1996. doi:10.1207/s15327752jpa6601_2.

Arianna Salazar-Miranda, Zhuangyuan Fan, Michael Baick, Keith N. Hampton, Fábio Duarte, Becky P. Y. Loo, Edward L. Glaeser, and Carlo Ratti. Exploring the social life of urban spaces through ai. *Proceedings of the National Academy of Sciences*, 122(30):e2424662122, 2025. doi:10.1073/pnas.2424662122. URL https://doi.org/10.1073/pnas.2424662122.

Gillian M. Sandstrom and Elizabeth W. Dunn. Is efficiency overrated? minimal social interactions lead to belonging and positive affect. *Social Psychological and Personality Science*, 5(4):437–442, 2014a. doi:10.1177/1948550613502990.

Gillian M. Sandstrom and Elizabeth W Dunn. Social interactions and well-being: The surprising power of weak ties. *Personality and Social Psychology Bulletin*, 40(7):910–922, 2014b. doi:10.1177/0146167214529799.

Ziggi Ivan Santini, Paul E. Jose, Erin York Cornwell, Ai Koyanagi, Line Nielsen, Carsten Hinrichsen, Charlotte Meilstrup, Katrine R. Madsen, and Vibeke Koushede. Social disconnectedness, perceived isolation, and symptoms of depression and anxiety among older americans (nshap): a longitudinal mediation analysis. *The Lancet Public Health*, 5(1):e62–e70, 2020. doi:10.1016/S2468-2667(19)30230-0.

Richard Sennett. *The Fall of Public Man*. Alfred A. Knopf, New York, 1977. ISBN 9780394487151.

Seoul Metropolitan Government. Seoul live camera. Seoul Metropolitan Government website, 2024. URL https://world.seoul.go.kr/news-events/multimedia/seoul-live/.

Patrick Sharkey. Homebound: The long-term rise in time spent at home among u.s. adults. *Sociological Science*, 11:553–578, 2024. doi:10.15195/v11.a20. URL https://doi.org/10.15195/v11.a20.

Georg Simmel. The metropolis and mental life. In Kurt H. Wolff, editor, *The Sociology of Georg Simmel*. Free Press, New York, 1903.

C. Anna Spurlock, Annika Todd-Blick, Gabrielle Wong-Parodi, and Victor Walker. Children, income, and the impact of home delivery on household shopping trips. *Transportation Research Record*, 2674 (10):335–350, 2020. doi:10.1177/0361198120935113.

Statistics Korea. 2023 cause of death statistics, 2023. URL https://mods.go.kr/board.es?mid=a20108100000&bid=11773&act=view&list_no=433679.

Statistics Korea. 2024 통계로 보는 1인가구 [single-person households in statistics 2024]. Statistical report, Statistics Korea (KOSTAT), 2024. URL https://www.kostat.go.kr/board.es?mid=a10301010000&bid=10820&tag=&act=view&list_no=439064&ref_bid=.

Jodi Sturge. The adaptation of the dementia village model: comparing design features of a Dutch and Canadian dementia village. In Kristina Niedderer, Geke Ludden, Tom Dening, and Vjera Holthoff-Detto, editors, *Design for Dementia, Mental Health and Wellbeing: Co-Design, Interventions and Policy*, chapter 16. Routledge, 2024. doi:10.4324/9781003318262-16.

Daniel L. Surkalim, Mengyun Luo, Robert Eres, Klaus Gebel, Joseph van Buskirk, Adrian Bauman, and Ding Ding. The prevalence of loneliness across 113 countries: systematic review and meta-analysis. *BMJ*, 376:e067068, 2022. doi:10.1136/bmj-2021-067068.

Texas Legislature. Public school finance recapture ("robin hood" plan). Texas Education Code Chapter 49 (originally enacted as Senate Bill 7, 1993; codified ch. 41 until repealed and moved to ch. 49 by HB 3, 86th Leg., 2019), 2019. URL https://tea.texas.gov/finance-and-grants/state-funding/excess-local-revenue.

Tokyo Metropolitan Government. Trends in the number of public bathhouses. Bureau of Consumer Affairs, Tokyo Metropolitan Government, 2024. URL https://www.shouhiseikatu.metro.tokyo.lg.jp/chousa/yokujyo/.

Sherry Turkle. *Alone Together: Why We Expect More from Technology and Less from Each Other*. Basic Books, New York, 2011. ISBN 9780465010219.

Jean M. Twenge, Jonathan Haidt, Andrew B. Blake, Cooper McAllister, Hannah Lemon, and Astrid Le Roy. Worldwide increases in adolescent loneliness. *Journal of Adolescence*, 93:257–269, 2021. doi:10.1016/j.adolescence.2021.06.006.

UNESCO. Cultural space of Jemaa el-Fna square. Representative List of the Intangible Cultural Heritage of Humanity, element no. 00014, 2008. URL https://ich.unesco.org/en/RL/cultural-space-of-jemaa-el-fna-square-00014.

United Nations Department of Economic and Social Affairs, Population Division. World urbanization prospects 2025: Summary of results. Report UN DESA/POP/2025/TR/NO. 12, United Nations, 2025. URL https://desapublications.un.org/publications/world-urbanization-prospects-2025-summary-results.

U.S. Bureau of Labor Statistics. American time use survey — 2022 results. Technical report, U.S. Department of Labor, June 2023. URL https://www.bls.gov/news.release/archives/atus_06222023.pdf.

Nicole K. Valtorta, Mona Kanaan, Simon Gilbody, Sara Ronzi, and Barbara Hanratty. Loneliness and social isolation as risk factors for coronary heart disease and stroke: systematic review and meta-analysis of longitudinal observational studies. *Heart*, 102(13):1009–1016, 2016. doi:10.1136/heartjnl-2015-308790.

W.H Whyte. *The Social Life of Small Urban Spaces*. Conservation Foundation, Washington, DC, 1980. ISBN 9780970632418. URL https://www.pps.org/product/the-social-life-of-small-urban-spaces.

Sarah Williams, Chaewon Ahn, Hayrettin Gunc, Ege Ozgirin, Michael Pearce, and Zhekun Xiong. Evaluating sensors for the measurement of public life: A future in image processing. *Environment and Planning B: Urban Analytics and City Science*, 46(8):1534–1548, 2019. doi:10.1177/2399808319852636.

Nils Wolff, Layne Perry, Titus Venverloo, Geertje Slingerland, Jessica Wreyford, Paolo Santi, and Fábio Duarte. Pedestrian trajectory dataset of public european squares. *Scientific Data*, 13:402, 2026. doi:10.1038/s41597-026-06686-6. URL https://www.nature.com/articles/s41597-026-06686-6.

World Health Organization. Who commission on social connection. WHO Initiative, launched November 2023, 2023. URL https://www.who.int/groups/commission-on-social-connection.

Longqi Yang, David Holtz, Sonia Jaffe, Siddharth Suri, Shilpi Sinha, Jeffrey Weston, Connor Joyce, Neha Shah, Kevin Sherman, Brent Hecht, and Jaime Teevan. The effects of remote work on collaboration among information workers. *Nature Human Behaviour*, 6(1):43–54, 2022. doi:10.1038/s41562-021-01196-4.

Robert B. Zajonc. Social facilitation. *Science*, 149(3681):269–274, 1965. doi:10.1126/science.149.3681.269.

Pengfei Zhu, Longyin Wen, Dawei Du, Xiao Bian, Heng Fan, Qinghua Hu, and Haibin Ling. Detection and tracking meet drones challenge. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 44(11):7380–7399, 2022. doi:10.1109/TPAMI.2021.3119563. URL https://arxiv.org/abs/2001.06303.

Well, looks like I'm stuck here. Why don't you go on without me, and I'll be catching up with you somewhere along the line.