Expressions of Community

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Preface

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1 Introduction

1.1 Short version

1.1.1 Questions and goals

In this dissertation, I propose to study expressions of and experiences of community in order to better understand what community means, how community happens, and what community does. My empirical focus is on expressions of community from LGBTQ people, because community in LGBTQ contexts is highly resonant and visible rather than relegated to the background or taken for granted.

My investigation will proceed in three parts. I begin by examining **how the ordinary meaning of community is constructed through its use.** Does everyday talk about community invoke or map onto sociological understandings of *Gemeinschaft*? Are those sociological resonances more apparent in LGBTQ community discourse than in more generic or neutral social contexts? Second, I'll investigate **how individual sense of community varies across place-based contexts.** Do simple structural features of place-based contexts suffice to explain variations in belonging? Or are there differences beyond that, something more? Third, I'll investigate **the consequences of community-oriented talk in virtual communities.** Do linguistic expressions of community come from embedded or peripheral actors? Do they result in downstream

interactional consequences, or are they mere rhetoric?

This work will make two contributions: First, I aim to refine our understanding of how distinct aspects of community – shared culture, place, social ties – relate to each other; I anticipate finding that these are largely complementary rather than substitutes. Second, I aim to connect some disparate threads across existing research in order to systematically show that community can happen in at least two distinct ways: either it can be predicated on sameness in a narrow and exclusionary way, or it can be intrinsically heterogeneous and inclusive. The former is unsurprising, but the latter type of community expands the boundaries of how we might think of community as being empirically possible.

Recent historical and contemporary LGBTQ communities provide an interesting set of cases for me to draw on in order to understand the operation of community writ large, for several reasons. First, LGBTQ community cannot be taken for granted; LGBTQ people who want community together must actively seek it out (sometimes through literal migration) and build it. "Queer cultural reproduction" (Orne 2017) takes conscious choice and effort. Compared to contexts where community might be relegated to the background, like Tönnies's stereotypical peasant village, this makes LGBTQ expressions of community highly visible and conducive to study. Second, even though the historical emergence of LGBTQ communities and identities is a relatively recent phenomenon (Bérubé 2011; D'Emilio 1992), LGBTQ communities cover the full range of things that a community can be, according to typologies of Gemeinschaft like Brint (2001)'s. Such communities can be virtual or emplaced; they can span from concrete social ties to imagined collectivities. Metaphorical concepts like constellations (Gieseking 2020) and archipelagoes (Ghaziani 2014b) are used to characterize and emphasize the variety and interconnectedness of queer communities (for those two authors, specifically as they

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unfold in urban spaces). This variation is real and meaningful but not infinite; Winer (2020) has shown how "gay imagined communities" possess a clear, concrete "imagined center" to which individual gay, bi, and queer men have ambivalent relations – what Winer calls "solidarity with disdain."

Finally, LGBTQ communities can be homogeneous or diverse. Sometimes differences and tensions divide lesbian, bi and queer women from gay, bi and queer men; lesbians and gay men from bisexuals; cis LGBQ people from trans people; and queer people from people with more defined or less fluid orientations. Sometimes, LGBTQ people bridge those differences and build community together. They also can bridge or fail to bridge other kinds of social difference: race, age, class, and so on. A rich qualitative literature documents and categorizes the forms LGBTQ community can take, establishing that multiple distinct types of LGBTQ community can exist, characterized in part by their differing approaches to difference. Brown-Saracino (2017) shows how, for LBQ women in small cities, there might be a singular "lesbian community" premised on the sameness of identity, or a "hybrid" form of identity and community predicated on identities that are diverse and plural instead – or else, a third option, LBQ community can be effectively nonexistent, folding into a broader "ambient community" instead. Orne (2017) charts the "Disneyfication" of Boystown in Chicago alongside the failures of alternative queer political spaces to live up to their ideals; instead, they find the most radical and interesting potential in "sexy communities." Together, these two ethnographies show that both ways of forming community around a shared identity – shared sameness, or shared difference – happen in various times and places. I'll develop a way of studying expressions of community that accommodates both of these possibilities, and I'll foreground heterogeneity when I turn to studying perceived experiences of community.

1.1.2 A few theoretical clarifications

It's worth emphasizing at the outset that identity does not automatically create community. A conceit of this project is that identities like sexuality *might be* a basis for creating community, but probably only in conjunction with other features that might be shared, and active work on the part of cultural entrepreneurs. It is because community building in this context takes work that the study of expressions is so valuable.

What are those shared features that might make up a sociological definition of community? My work focuses on three: shared culture, shared ties, and shared place. I think it's possible to rank those features, in that order, based on prior research that's gone into refining the concept of community and exploring its limits. I don't plan to reevaluate the relative importance of these factors in this dissertation, but the structure-culture tension and the disputed role of place affect the operational choices I make and will shape how I interpret my findings.

Why culture over ties? The starkest example is the concept of "imagined communities," which dispense with the possibility of interaction among all, or even most, members of a given community entirely. Beyond that, however, a number of studies have found that a shared moral order (Vaisey 2007) or perception of cohesion (Boessen et al. 2014) matters more for creating a sense of community (Gemeinschaft) than do social interactions or ties.

Why ties over place? If community has turned out to be "liberated" rather than "lost" (Kelly et al. 2014; Wellman 1979), and if virtual community is possible (Driskell and Lyon 2002; Rheingold 2000), then that suggests that shared ties take precedence over shared place. But at the same time, these characteristics might complement rather than supplement each other. We know that the rise of virtual connections has not led to the death of distance (Spiro, Almquist, and Butts 2016), and mostly-virtual communities

can hold in-person meetups that strengthen members' sense of togetherness (Rheingold 2000). (More generally, "augmented reality" rather than "digital dualism" describes how virtual and offline experiences of community might intersect (Jurgenson 2011; Orne 2017).)

Given this complementarity, another way to put this might be that the more of these features are present to some degree, the more "prototypical" a community looks (Bruckman 2022): a tight-knit small town has all three, a group of Wikipedians has two, and a nation-state has only one. But breaking down the potential features that create a community goes some way toward explaining a key finding from qualitative studies of everyday conceptualizations of community (Levine 2017; Winer 2020), that the *referent* for "community" can be hard to pin down precisely. Is it all the people in a place, a set of people with social relations to each other, or people connected by a shared (sub)culture? This referential ambiguity partly arises from the multiple, potentially conflicting, elements of the definition of community.

But, backing up one step further, there's one more theoretical point to clarify: what's culture, anyway? At least as it relates to creating community, culture extends beyond moral values and beliefs, to include group styles, norms, and practices; it includes both declarative (i.e. linguistic or discursive) and nondeclarative (i.e. practical or embodied) modes (Lizardo 2017). Reproduction of queer cultures – and thereby queer communities – manifests everywhere from socialization into particular kinds of lesbian identity talk (Brown-Saracino 2017) to acquisition of a particular gay habitus (Orne 2017). I'd use those examples to deviate from Vaisey (2007) and argue that in focusing only on moral values as key to Gemeinschaft, he's not expansive enough.

But what does it mean for culture to be shared? And why do I think something like "cultural density" might be better than "moral unity" (Vaisey 2007) to describe how

shared culture generates community? Culture is structured; beliefs, values, symbols, etc. fit together into systems of meaning through schemas and frames. Without delving too deeply into the cognitive details, I think certain configurations of cultural ideas and practices allow for the incorporation of diversity and variation into the framework of a single community, while others don't; again, I lean on those examples from Orne and Brown-Saracino as a sort of existence proof.

1.1.3 A note on methods

I am taking a quantitative and computational approach to studying LGBTQ expressions of community. This offers a breadth and scale that complements and extends the deeply grounded research that already exists in this area. It's also a logical fit: given my theoretical framework and expectations, I need a window into how culture is structured, and I need to connect other attributes like ties, interactions, and place. Computational and digital methods – especially techniques from computational text analysis – provide this. They expand what can be done with traditional quantitative methods and enable me to build more directly on prior qualitative research. CSS methods can incorporate more insights from qualitative work into a quantitative framework, especially in terms of measuring and operationalizing culture (Mohr et al. 2020). Novel techniques like word embeddings are particularly suited for measuring how culture is structured into schemas and frames (Arseniev-Koehler and Foster 2022; Boutyline, Cornell, and Arseniev-Koehler 2021). These methods have limitations; most explicitly, they are not suited for studying the nondeclarative, embodied aspects of group culture (Lizardo 2017; Orne 2017). That is one reason for my focus on the linguistic, discursive aspects of culture and community. There will be other gaps – wouldn't it be ideal if I had the kinds of data I plan to use in chapters 1, 2, and 3 all for the *same* LGBTQ community or set

of communities? – but triangulating through multiple, partial cases is the most realistic way forward.

1.2 Long version

1.2.1 Introduction

"Community" does a lot of work out there in the social world. Why do social media companies purport to give people tools to "build community" with – and why have billions of people adopted those tools? Why do protestors demand not only that cities defund police departments, but also that they "invest in community" instead? In these varied circumstances, community is a motivation, an end, an object of desire, even an solution to social problems. I'll pose community as a question instead. I want to investigate variations in what community means, how it happens, and what it does, by focusing particularly on the varied experiences of LGBTQ people and the communities they belong to.

At the same time, significant debates about the nature and operation of community have long taken place in sociology. What's the relation between community and society (Tönnies [1887] 2001)? Has community been lost or saved or liberated in contemporary post-industrial societies (Hampton and Wellman 2018; Kelly et al. 2014; Wellman 1979; Wellman and Leighton 1979)? How bound is community to place, or is virtual community also possible (Baym 1994; Calhoun 1998; Driskell and Lyon 2002; Rheingold 2000)? Though many of these debates are settled, they show that community is an object of theoretical contention as well. I aim to unsettle some of what we think we know about community, by paying close attention to the margins of the phenomenon.

I'll do this through triangulation, attacking the phenomenon from multiple comple-

mentary angles. As you read this proposal, you might see ways any one chapter could be expanded into a deeper, more focused dissertation on its own. But I'm aiming for breadth instead. In other words, I plan to shamelessly take advantage of my disciplinary home in sociology – not linguistics, not geography, not human-computer interaction. I'm not bound to study language, or place, or technology – only some facet of the social world. I can follow a social phenomenon, and a group of people for whom that phenomenon is often important, across multiple contexts. Those are my anchors.

Right now, each chapter proposal stands somewhat on its own. As they develop, I'll work to bring them closer together. I'd appreciate any thoughts you have about how to shape these projects so that they bend toward each other and align into a coherent whole. At the same time, by having distinct focal points, the chapters offer ways to bracket some of the moving parts – chapter 1 focuses squarely on discourse but remains somewhat descriptive; chapter 2 brings in representative survey measures but sacrifices some richness and detail; chapter 3 gives up that representativeness in order to study relational processes in more depth.

At a discursive level, I will examine the literal meaning and broader resonance of "community," as part of a relational system of words and meanings. How does community vary in terms of what it means in everyday social discourse? How do expressions of community vary among social groups and social contexts? Can linguistic expressions of community and belonging be a measurement tool for something deeper? In LGBTQ contexts I expect the meaning of community to be more closely tied to identity and to Gemeinschaft than to mundane notions of place; I also expect more frequent expressions of language invoking community and belonging.

Scaling up to the level of broader contextual characteristics and down to the level of individually-reported experienced sense of community, I will next investigate the relation

between the two. How do cultural and place-based features like density and diversity shape variation in individual sense of community? I expect those features to facilitate community and belonging for LGBTQ people, especially in their connectedness to the LGBTQ community specifically, where they might not do the same for other groups of people.

Finally, at a relational level, through a case based in virtual communities; connect discursive measures from the first project with similar contextual features as in the second. How do expressions of community relate to structural and interactional dynamics like embeddedness within a group? While I expect the most embedded individuals to strongly invoke language of community and belonging in order to build community for the group, the most peripheral individuals within a network may do likewise in their own attempts to belong. LGBTQ virtual spaces provide a context wherein expressions of community are highly visible and where these processes can be observed.

This multifaceted, multi-pronged investigation matters because it interrogates who community is for and when community is possible. What are the limits, the edges, the boundaries? Who gets to experience belonging? Some framings of community are conducive to diversity, heterogeneity, and inclusion; some are narrow, homogenizing, and exclusionary. The former offer more chances to more people to have experiences of community. To the extent that community is a positive thing for individuals to experience and participate in, something worth creating and seeking out, finding out more about the unexpected and counterintuitive conditions under which belonging can emerge is a worthwhile endeavor.[1] Moreover, in addition to being an end in itself,

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[1]Community is bad sometimes – i.e., even when an individual experiences it as a positive, the externalities of it can be quite negative. Think of white nationalist groups or men's rights activists or QAnon conspiracy theorists. One of the things people in those groups talk about gaining is a sense of belonging; many outsiders might seriously prefer that these people found some other way to achieve that experience. Granted, other people think that queer community is literally destroying the fabric of society.

community can be a precursor to various forms of collective and social action, like political mobilization. Understanding variations in the meaning, the conditions, and the consequences of community enriches our knowledge of a phenomenon that provides grounds for much of social life.

1.2.2 Motivation

1.2.2.1 Background

Community is a meso-level social phenomenon that springs into existence when certain conditions are met. In turn, it's something people might long for or become attached to, something that can motivate them to individual or collective action. There's a stable core to this phenomenon which is well understood, because community has long been one of the core sociological concepts. Community is the product of social density and cultural density, the result of both of which is the perception and reality of a group people can belong to and form attachments to. Social density in the form of relations and interactions is essential, but network cohesion alone is not sufficient for the emergence of a coherent and perceived community. Social density is often associated with physical density or emplaced co-presence (Collins 2004; Durkheim [1893] 1997), but the reality of virtual communities has shown that place, while beneficial, is not essential to the formation of community (Hampton and Wellman 2003; Rheingold 2000). What is necessary, however, is some form of shared culture. The precise terminology for cultural density varies in the literature; for instance, Vaisey (2007) refers to "moral unity" as the key to *Gemeinschaft*, while Tavory (2016) refers to "moral density"; I prefer "cultural" over "moral" because it encompasses norms, styles, and schemas that aren't necessarily moral values, but am alluding to the same domain. Similarly, I use "density" over "unity" because the latter takes for granted an assumption of sameness or uniformity,

which is not universally present in all communities.

Despite these recognizable core characteristics, community is also a notoriously broad and ambiguous concept. Partly this is because communities come in a complex taxonomy (Brint 2001), from the prototypical peasant village (Bruckman 2022; Tönnies [1887] 2001) all the way to virtual (Rheingold 2000) and imagined communities (Anderson [1983] 2016). At the margins are types of communities that call key facets of the concept into question. For instance, virtual communities are noteworthy because they unsettle the centrality of place, showing that togetherness in place isn't essential to creating a community – even if the theory of augmented reality (as opposed to digital dualism) shows that place can still play a role even for virtual communities (Jurgenson 2011; Orne 2017; Rheingold 2000). Imagined communities, similarly, challenge the centrality of social interaction (but "are imagined communities real?" is an oxymoron). While this extensibility might seem to render the notion of community so flexible as to be analytically useless, individuals prove to be quite capable of perceiving community in the social world. A useful way to account for this flexibility is to conceive of community as a fuzzy, prototype-based category (Bowker and Star 2000; Bruckman 2022; Lakoff [1987] 2008; Lakoff and Johnson [1980] 2008). Layering more of these features – shared culture, social ties, togetherness in place – together produces more recognizable, more prototypical instances of community.

One way to observe how and where the meso, group-level phenomenon of community happens is at the individual level. This measurable individual experience and feeling of belonging is called "sense of community" (Boessen et al. 2014; Frost and Meyer 2012; Mannarini and Fedi 2009; McMillan 1996; McMillan and Chavis 1986), and it generally implies the perception that a group exists and that the individual is a member. This could be a misperception – all of the typical caveats of self-reports apply! –

but I find that generally unlikely. Individual sense of community is a useful barometer for the actual reality of community for two reasons.First, the threshold for forming an actual group is low (according to Simmel (2012), three people). Second, even if something perceived as a community completely lacks something sociologists might consider a fundamental definitional characteristic, that perception is informative – and that affective, experiential dimension really can shape individuals' social actions. This is, in fact, the insight behind imagined communities; though they operate at a scale where social interaction is impossible, they are real enough to motivate people to acts they would not engage in otherwise (Anderson [1983] 2016). Sense of community is a psychological rather than sociological concept, in individuals' heads rather than out there in the world. But some social phenomena are perceptual, cultural, and distributed, even shared collective feelings or experiences; community is one of those phenomena. Accordingly, measures of sense of community are one angle I'll take to understand how community itself happens.

While *community* and *sense of community* are well-established concepts and measures, I would propose a third, called *expressions of community.* This is a language or vocabulary of belonging, encompassing both explicit invocations of the concept of community as well as implicit statements that resonate with it. With this concept, I deviate from studies that measure belonging through subcultural innovation and group conformity (e.g., Lucy and Bamman 2021). Adoption of a group discursive style is one way a group culture is produced (Eliasoph and Lichterman 2003), of course, but not the same thing as expressions of community. Expressions of community are relational and potentially performative, i.e., they might be part of the process of creating community for a speaker or an audience. This potential is most evident in social discourse that is interactional, like a conversation. For instance, suppose that two members of

a group chat are debating the efficacy of vaccines, in an increasingly contentious way. A third member steps in to intervene, stating that we, as a community, have a range of opinions on many things, but we all belong together. Both contending parties moderate their debate going forward. Invoking community here is an act of repair, and achieves its intended proximate effect of reducing conflict – but for all parties involved, and for any bystanders, it potentially strengthens the very community being invoked. These attempts to invoke community are maybe not always successful in creating community. For instance, no matter that a property management company insists that its pricey apartment complex offers the chance to be part of a community alongside other amenities, this does not mean that neighbors actually talk to each other, much less feel any real sense of connection.[2] Observing the linguistic phenomenon and measuring its effects are distinct. Sociologists might interpret community talk as a kind of ritual (Collins 2004; Durkheim [1912] 2001), part of the work of welcoming new members, reaffirming longstanding commitments, or even repairing the group in moments of tensions. These expressions of community can be emotional, frequently bordering on trite and sentimental, but are still worth taking seriously for the impact they might have. In some circumstances, of course, they could be so formulaic and pervasive as to be bleached of meaning. In that way, part of what community talk simultaneously does is construct the meaning of community.

1.2.2.2 Research questions

Expressions of community provide the first puzzle for this research. How do they construct the meaning of community, and what connotations does that meaning entail?

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[2] One way to describe unsuccessful attempts at invoking community that are particularly blatant, cynical, inauthentic, or exploitative is "community-washing", by analogy with similar terms. I'm not alone in coining this term, which I first used privately in October 2020; a pair of British researchers came up with it independently in March 2021. https://sifted.eu/articles/community-led-platforms/

How does the meaning of community vary across discursive social contexts, as well as the depth and resonance of invocations of belonging? If part of what makes "community" ambiguous and hard to pin down is that it's a folk concept as well as an academic one, then treating the meaning of community as an empirical question is one way to make progress. Seeing if that meaning *varies* systematically will also be revealing – in my case, I suspect that community talk is ultimately more shallow in generic contexts and deeper and more resonant in texts coming from marginalized groups.

A second puzzle: how can "community" accommodate variation? Structural embeddedness and interactional density feel relatively clear to conceptualize and measure, though "ties" are cultural constructs (White [1965] 2008) and interactions presumably are as well. Cultural embeddedness, as Goldberg et al. (2016) might call it, or cultural density, as I prefer, is not so clear-cut. Does cultural embeddedness mean conformity? If so, how might we make sense of community spaces or groups that contain riotous diversity, wide ranges of self-expression, and strong norms of inclusivity? I'd argue that there are communities that are "dense" along this cultural dimension without being uniform. Maybe one reason is that beliefs and values and other constituent elements of culture aren't a hodgepodge simply stacked atop each other, they fit together in schemas and people use agency in engaging with them as a toolkit (Boutyline 2017; Goldberg 2011; Hunzaker and Valentino 2019; Swidler 1986). One simple way to make progress here might be to return to individual-level sense of community, and see whether that can be high in contexts of structural and cultural variation. Another way might be to leverage the distinction I drew above between group style, which implies a something shared or the same among group members, and linguistic expressions of community, which might provide a window into how community might exist alongside difference. Metaphorically, poking at the edges of the concept of community is how I expect to

uncover things that are interesting and unknown about how community happens and what it does in the world.

1.2.2.3 Case

Queer Counterpublics

By queer culture we mean a world-making project, where "world," like "public," differs from community or group because it necessarily includes more people than can be identified, more spaces than can be mapped beyond a few reference points, modes of feeling that can be learned rather than experienced as a birthright. The queer world is a space of entrances, exits, unsystematized lines of acquaintance, project horizons, typifying examples, alternate routes, blockages, incommensurate geographies. World making, as much in the mode of dirty talk as of print-mediated representation, is dispersed through incommensurate registers, by definition *unrealizable* as community or identity.

– Berlant and Warner, "Sex in Public" (1998)

LGBTQ communities provide an interesting edge case for understanding the operation of community writ large. As Berlant and Warner's notion of queer counterpublics demonstrates, queer social worlds are fluid, heterogeneous, and complex; they have unique features that exceed the bounds of what might be recognizable as community. And yet, more down-to-earth ideas of community and identity are central to the experiences of many LGBTQ people. The emergence of queer spaces and the communities that inhabit them is improbable and surprising; their continued existence is contingent and fragile (Bérubé 2011; D'Emilio 1992; Ghaziani 2014b). But enough people evidently want them to make them happen – at first, in spite of stigma and oppression, and still,

in spite of normative and assimilatory pressures. Even today, many LGBTQ people want distinctive spaces in which to build queer community and culture (Pew Research Center 2013). Because queer community can't be taken for granted, it's an ideal site for observing explicit processes of community.

Several aspects of LGBTQ communities make them interesting. One unique feature is a lack of rootedness, which shapes queer life trajectories: for the most part, LGBTQ people are not born into and do not grow up in queer communities and queer spaces (Weston 1995). This is one reason that the existence and experience of queer community isn't something LGBTQ people can take for granted. I suspect that this is also one reason that surveys targeted toward LGBTQ people ask about community in detailed and explicit ways, where more general surveys often do not; the need for community is visible and salient in LGBTQ contexts. Similarly, this might be why LGBTQ people have sought out virtual communities since those spaces first came into being.

At the same time, LGBTQ identities are often strongly held and offer a strong basis for community formation. LGBTQ identity shapes attitudes toward sexuality, but also beliefs and values more broadly (Schnabel 2018). LGBTQ identities are potentially encompassing enough to constitute a subculture (Fischer 1975; Mattson 2015a) or a counterpublic (Berlant and Warner 1998), leading theorists to write about gay culture (Halperin 2012) or a way of life (Foucault 1998). Structurally speaking, the mere fact that gay/queer/LGBTQ community exists as a possible object of attachment and source of belonging is itself noteworthy; the identity itself structurally and cognitively provides a potential axis of belonging that isn't available otherwise. By contrast, the unmarked category of "heterosexual" isn't available as a source of community in the same way – referring, for instance, to "members of the heterosexual community" is nonsensical (Zerubavel 2018), even if many communities do have heteronormativity and

heterosexuality as defining or central traits (Eliasoph 1998).

Queer communities are marked by their diversity and fluidity, by a proliferation of identities, expressions, practices, and ways of being. Due to processes of social sorting, this variation is not observable everywhere; some particular LGBTQ groups and spaces are more homogeneous and exclusionary, some more diverse and welcoming. Importantly, whether they embrace difference or exclude it, queer communities are not utopic and egalitarian; they're structured by inequalities of race, class, age, gender, embodiment, etc. [CITE: numerous]. In the most optimistic assessments, queer communites and queer spaces might offer ways to complicate or bridge class (Mattson 2015b) or race (Orne 2017); a more pessimistic take might be that other social structures present a fundamental obstacle to fully experiencing or building community. Regardless, anarchic, chaotic variation is a defining feature of the overarching LGBTQ community as a whole (Brekhus 2003; Brown-Saracino 2017; Lichterman 1999; Mattson 2015b; Orne 2017). This variation might be thought to undermine community cohesion and lead to divisions, especially in the context of selective state recognition (Butler 2004a). But I would argue, and ultimately hope to show, that empirical reality is more complex than the most pessimistic predictions of queer theorists and activists – namely, that the most normative and assimilable LGBTQ people will leave the rest behind. For example, how much solidarity is there between cisgender LGBQ people and trans people, in the current moment of anti-trans activism and legislation? Far more than none, but perhaps still not enough. Lichterman (1999) once argued for "flexible forms of solidarity that sustain both unities and particularities," as essential for a multicultural democracies; I would argue that queer communities furnish an important example of that possibility. As political communities that are less stable and unitary, and more fluid or heterogeneous, they show how to facilitate both a sense of group belonging and the capacity for

collective action, while incorporating democratic notions of freedom (Butler 2004b).

I would not argue that the LGBTQ case is completely unique. In some ways, LGBTQ people might be similar to people who hold other marginalized and minoritized identities: shared experiences of social marginalization, stigma, and discrimination, or even the experience of being a numeric minority; all factors which could heighten the perceived need for community, affecting what it means and how it can be created. Those analytic features are important, but I don't aim to use them to draw analogies between, say, sexuality and race (i.e., between the experiences of LGBTQ people and people of color). A key reason researchers are reluctant to analogize in that way is that people of course simultaneously hold multiple social identities, or occupy multiple social positions, and those identities can interact in complex ways. To translate that identity-oriented frame into terms of community and belonging, it's very likely that queer people of color find their ability to experience belonging in queer spaces to be mediated by race (Held 2017), and in communities of color mediated by sexuality. In any case, stigma and exclusion in heteronormative spaces operate as a push factor in tandem with the attractive pull of queer community, to explain why and how LGBTQ people come to seek out queer spaces. Variation on both of those fronts shapes how LGBTQ individuals experience connection to and participation in LGBTQ community.

Examining different ways queer community can play out across distinct geographic, temporal, and technological settings is how I might aim to triangulate around the concept of community. For some of the projects I propose below, a generic counterpart may provide a means of comparison; in other cases, internal variation might be adequate.

1.2.2.4 Method

My methodological approach is quantitative and computational. It's oriented toward synthesis, and aimed at complementing prior work on queer communities, and about community more broadly. This prior work is primarily qualitative, and I think there's space to try something different. I'll combine techniques for text, spatial, and network data analysis with conventional methods, and draw on the advantages of quantitative methods for studying variation. This also plays to the strengths of my training. What I'm offering here by taking a computational and quantitative approach to community is a different angle – not necessarily a better one, but hopefully a complementary one, and one that I'm uniquely positioned to undertake.

2 Density and abundance

How place characteristics shape individual sense of community for LGBQ people

For a community to exist, people have to *feel* that one exists, and that they're a part of it. How do they come to feel that way? This chapter investigates one aspect of that process, by using nationally-representative survey data from LGBQ people in the United States to assess how contextual characteristics of places are associated with individual experiences of sense of community and belonging. I identify two key place-based elements that might contribute toward creating a sense of community around LGBTQ identity, namely density and minority abundance.

Community itself is a meso-level social entity that comes into existence through the overlap of social interactional density and shared cultural or moral density (i.e. group styles, embodied habitus, values). Geographical proximity – what Durkheim called physical density (Durkheim [1912] 2001; Tavory 2016) – often facilitates the emergence of this collective entity, but it isn't intrinsically essential. But if community is a collective and sociological construct, *sense of community* is more of a psychological and individual one – the personal experience of belonging to a larger collective entity. (Which, unless we want to contend that people are delusional, implies the existence of that social entity.)

The motivation for this work, then, is the fact that an individual's sense of community

is shaped by structural features of the contexts in which they are embedded (Boessen et al. 2014). Purely virtual and distributed communities (Driskell and Lyon 2002) aside, experiences of community are typically local and emplaced (Brint 2001). At the broadest level, then, place characteristics might shape how and whether individuals experience a strong sense of community. Place characteristics most obviously matter for place attachment; but they also matter for other objects of belonging, like identity-based groups.

LGBTQ people provide a particularly interesting case to study the strength of community. For marginalized and minority groups, the stakes of belonging are heightened in light of a history of stigma and exclusion; the place characteristics that matter might differ from those that facilitate community for the generic, unmarked majority (see Zerubavel 2018 for a discussion of markedness). For instance, whether homogeneity lead to a feeling of cohesion, or whether it is instead stifling, depends on who a person is. Because LGBTQ experiences of community have the potential to be unique, I'm interested in what those experiences might reveal about the relationship between place and community. Moreover, LGBTQ attachments to community are already known to be emplaced, both through the existence of archetypical institutions like gay bars (Mattson 2020) and gayborhoods (Ghaziani 2014b) as well as through broader and more diffuse constellations of significant places (Gieseking 2020). By linking features of places to individual LGBQ experiences, I aim to uncover the conditions that facilitate sense of community.

My broad research question, then, is **what features of individuals and places are associated with individual sense of community for LGBTQ people?** I focus on the role of two place characteristics in particular: overall population density, and the prevalence or abundance of LGBTQ people (using same-sex couples as a proxy

measure). Specifically, do dense places full of LGBTQ people (and institutions) facilitate a greater sense of connection to the LGBTQ community? Or, conversely, are those exactly the places where LGBTQ community fades into the background? To preview my results, I ultimately find more support for the former hypothesis, with moderate, mixed evidence for density mattering for community in a positive way, and strong evidence for the prevalence of LGBTQ people mattering in the same way. Of course, this analysis only uncovers statistical associations from observational data rather than causal relations, focusing on relatively durable place characteristics and controlling for relatively fixed or seldom-changing individual traits (neither of which are great candidates for observational causal inference).

A note on terminology before I proceed – the alphabet is complicated. The Generations survey (Meyer 2020) purports to be a study of LGB people, but it also includes people with other sexual minority identities. It asks these $LGBQ$ respondents about $LGBT$ community – i.e., trans people are included in the imagined community, even though they are not among those screened into this survey. It might be analytically convenient if the bounds of identity inclusion represented in these acronyms were consistent, but that's not how LGBTQIA+ identities, communities, and discourse work. I would interpret the survey questions as gesturing toward an expansive and inclusive imagined LGBTQ community, and I will write about LGBTQ community or queer community when I mean to speak generally rather than about the specific questions or respondents.

2.1 Background

My baseline expectation is that a dense place-based context with an abundance of queer people and institutions will facilitate a correspondingly strong sense of belong-

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ing and connectedness to the LGBTQ community for individual survey respondents, with ancillary spillover benefits for belonging and wellbeing overall. By density, I simply mean physical density of people; since Durkheim, sociologists recognized that this physical density facilitates a social density of interactions (Durkheim [1912] 2001; Tavory 2016). Moreover, cities are historically entwined with the formation of collective LGBTQ identity (D'Emilio 1992), so much so that LGBTQ studies has been critiqued for its metronormative emphasis (Halberstam 2005). A main mechanism for density to contribute to a sense of community for LGBTQ people is *movement*; this stereotypical story of the attractive force of gay urban life (D'Emilio 1992) has also been called the "great gay migration" (Weston 1995). This means that the prevalence or abundance of LGBTQ pople is likely to be a specific draw that also positively contributes to experiences of community, especially given that most LGBTQ people do not necessarily grow up around many other queer people or with access to queer spaces. In any case, it's easy to imagine concentrations of LGBTQ life as an attractive force, leading queer people to concentrate around each other and to individually experience a greater sense of community as a result.

More broadly, however, the case for cities as sites of community is more ambivalent. Though some have advocated for cities as enablers of collective life (Jacobs 1961), classic sociological work instead sees urban life as facilitating either individualism (Simmel [1903] 1971) and the substitution of *Gemeinschaft* for *Gesellschaft* (Tönnies [1887] 2001). Queer urban migration may fit into the broader social process of what's been called the "big sort" (Bishop 2009), where people have self-selected into geographic regions according to values, lifestyles, and other factors. If those that remain in less-dense places with fewer LGBTQ people are also self-selected in this same way, then that might lessen the differences between rural and urban LGBTQ people according to geographic

context.

The qualitative literature on LGBTQ collectivities additionally hints at some alternative possibilities. Perhaps individuals' perceived sense of belonging and connectedness to the LGBTQ community does not correlate with – or even runs counter to – the abundance, density, and diversity of LGBTQ people and institutions in a place. If that were the case, that would suggest that the perceptual experience of community might stand in and symbolically substitute for structural and demographic "facts on the ground," rather than complementing or arising from them. In other words, maybe a place like San Francisco winds up being like Brown-Saracino (2017)'s Ithaca, and "ambient community" there takes the place of LGBTQ community specifically. Winer (2020)'s related key finding of "solidarity with disdain" might have place-based limitations as well – his interviewees, after all, come only from Southern California. In smaller and more scattered contexts LGBTQ people might not be able to afford to symbolically distance themselves from the imagined center of the gay community the way Winer's respondents frequently do. Finally, Forstie (2020)'s study of LGBTQ communities in small cities raises the possibility that those LGBTQ communities might in fact be less fragmented and more cohesive, especially across lines of difference, compared to communities in larger cities.

The data sources I'll combine allow me a unique opportunity to evaluate theories from this qualitative literature, by complementing their depth with breadth and scale. For instance, while Brown-Saracino (2017) gains analytic leverage by looking at places that are very similar to each other on the surface and exploring their differences, she can't explore the full space of places where LGBTQ people live and where they might experience community (or not). But the three kinds of place-based identities she uncovers can be mapped onto community connectedness measures like those in the Generations

study. In her language, "hybrid identities" and traditional lesbian communities would *both* be consistent with a strong sense of belonging to the LGBTQ community. By contrast, "ambient community" would be signaled by high belonging in general but low LGBTQ-connectedness specifically. Thus, those sense-of-community survey measures have the potential to be informative even though they can't distinguish what, exactly, "LGBTQ community" means in a given place or what precise forms it takes. (While the Generations survey asks about connections to "*the* LGBT community," actual LGBTQ communities are often multiple or fragmented.)

One of the challenges of studying experiences of community is the slipperiness of the referent – what, in a given case, is "the community"? A second important challenge is to distinguish community from related concepts like identity, even when a community might be based on a particular social identity. One of the unique aspects of the Generations survey is that it actually captures (some of) this complexity. Most importantly, it asks respondents about their connection and belonging to *any* community and to *LGBTQ community specifically*. It also includes separate questions about LGBTQ community and identity, which matters because community connectedness is not the same construct as identity salience, although the two are presumably related. I use the two distinct measures of community connectedness as my primary outcomes and include individual characteristics (including sexual orientation, gender identity, race, age) alongside my key place-based measures as covariates that capture potentially-salient sources of variation.

Of course, the two factors of density and abundance aren't exhaustive of spatial characteristics that might matter for community. Material resources and institutions – especially the presence and concentrations of third places like bars and coffee shops (Oldenburg 1998) – no doubt could positively contribute to a sense of community as

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well. Queer anchor institutions (Ghaziani 2014a), however, are likely to coincide with the presence of same-sex couples. In addition, structural and demographic characteristics have the drawback of being overly broad, in that they don't capture the specificity of a particular place (Gieryn 2000) – which might be more or less conducive to community. This remainder can be conceptualized as *place-based culture* (Brown-Saracino 2017). Place narratives might even mediate the relation between structural features and individual experiences of community; indeed, ethnographers say these stories matter (Brown-Saracino 2017; Orne 2017), that they're part of how community plays out differently in practice even in places that appear similar on the surface. I'm unable to address those fundamental limitations in this chapter; the geographic characteristics I analyze here can only measure the background context in which individual social worlds take place.

2.2 Data and methods

The contribution of this chapter is to analyze the association between place characteristics from the ACS (at the ZCTA and MSA levels) with individual survey responses about community and belonging in wave 1 of the Generations study.

The key data source for this chapter is the *Generations* study (Meyer 2020), a three-wave representative panel survey of three age cohorts of cisgender Black, white, and Latinx lesbian, gay, bisexual, and queer and other nonheterosexual (LGBQ) people in the United States. The publicly-available version of the data set includes multiple measures of sense of community and belonging as parts of two composite scales: a generic *Social Wellbeing* scale and an LGBT-specific *Community Connectedness* scale. The public data, however, do not include geographic location beyond urban/rural and Census region. The restricted portion of the data set records respondent locations at

more granular geographies: state, metropolitan/micropolitan statistical area, and finally zip code. To maintain respondent privacy, these restricted data are held by the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan and accessed through a secure virtual environment, with a data use agreement to maintain confidentiality. (One key provision of this agreement: I cannot disclose *which* geographic locations are actually observed in the Generations data, although I present summary statistics below.) The University of Washington IRB approved the use of the restricted data for this study.

I use four measures from wave 1 of the Generations study - both the two full scales and the first single item from each - as outcome variables to represent community and belonging. The multi-item scales are validated and robust. By contrast, single items from those scales are framed to more precisely target *belonging.* While it's important to justify deviations from standard, validated scales (Mustillo, Lizardo, and McVeigh 2018), it's also important not to over-project meaning onto latent constructs derived from survey measures or take those meanings for granted (Martin and Lembo 2020, 2021). As a compromise, I analyze both and discuss any noteworthy divergences below. These are the scales and items I analyze:

- The **LGBT Community Connectedness** scale, a 4-point scale constructed from an average of 7 items, previously validated as a cognitive/affective construct in Frost and Meyer (2012). Items touch on emotional attachment, participation, and political and collective action within "the" (singular) LGBT community.
- The **Social Wellbeing** scale, a 7-point scale constructed from an average of 15 items. This scale includes not only items that ask about respondents' relations to community, but also to society and the world more broadly.
- The first item on the Community Connectedness scale, "You feel you're a part of

the LGBT community," with four response options ranging from "Agree strongly" to "Disagree strongly."

- The first item on the Social Wellbeing scale, "I don't feel I belong to anything I'd call a community," with seven response options ranging from "Strongly disagree" to "Strongly agree." (*Strongly disagree* with this negative statement corresponds in direction to *agree strongly* on the LGBT Community Connnectedness question, so I align my model results and figures accordingly.)

For place-based data, I draw on the US Census Bureau's American Community Survey via the tidycensus package (Walker and Herman 2023). At the smallest levels of geography, only pooled 5-year ACS estimates are available. I use the 2019 estimates (from 2015-2019), which overlap with wave 1 of the Generations survey (2017-2018) and also have the highest-quality same-sex couples data. I uploaded relevant covariates, for all ZCTAs and MSAs, to ICPSR's virtual data enclave, and then joined and filtered them to only the zip codes and MSAs from which respondents in the Generations study were sampled.

In this paper, I consider two focal place-based covariates from the ACS: population density and prevalence of same-sex couples. I analyze these place variables at two geographic levels available in the restricted Generations data - ZCTA and MSA. At the MSA level, I use population-weighted densities aggregated up from the zip code level, to account for the fact that MSA boundaries - derived from counties - vary hugely across different regions of the country (Ottensmann 2018). I focus primarily on results at the zip-code level, which turn out to be more substantively and statistically significant.

In my statistical models, I test four different functional specifications of the association between population density and community/belonging:

- **Linear.** The most straightforward specification, allowing me to detect whether

denser places are associated with a stronger or weaker experience of community.

- **Quadratic.** A theoretically-informed extension of the linear specification. This allows for the possibility, discussed above, that both rural small towns and large urban environments are more conducive to community and belonging than suburban sprawl.

- **Logarithmic.** A data-driven transformation, because the distribution of ZCTA population densities is right-skewed. Taking the (base-10) log produces a more normal distribution of the variable. (Because of this same skew, I present plots involving population density on a log scale below.) Like the linear specification, the log transformation can only be monotonically increasing or decreasing.

- **Spline.** Agnostic and flexible, using a generalized additive model (GAM) to learn a potentially nonlinear functional form from the data.

As I'll show below, while the more complex specifications sound plausible, there's no evidence to support their use.

I use only one specification for the prevalence/abundance of LGBTQ+ people: the proportion of households that are same-sex couples. There are no fine-grained geographic estimates of LGBTQ+ identity (and based on Census Bureau trends, there never will be), so partnered households are the best proxy. I considered instead using *counts* of same-sex couples, as well as total population counts, rather than constructing two variables that are essentially *rates*. (Note: Because I pull same-sex couple counts and household counts from separate ACS tables, a few zip codes have nonsensical or extreme values for percent same-sex couples, which I drop from summary statistics. These are zip codes with small populations and/or high proportions of residents in group quarters.) It's an open question whether the *proportion* or *count* of same-sex couples is theoretically more important, but this alternate (and potentially simpler) specification did not turn

out be especially promising, so I did not explore it systematically.

I control for a set of individual demographic, socioeconomic, and other identity-based characteristics from the Generations data: gender (cisgender women, cisgender men, and [some] nonbinary/genderqueer people; transgender potential respondents took the parallel TransPop survey, not the Generations survey), sexual orientation (lesbian/gay, bisexual, queer/other), age cohort (younger, middle, older), race (white, Black/African American, Latino/Hispanic), political affiliation (Republican, Democrat, independent/other), and education (high school or less, more than high school). Some of these traits are associated with community and belonging in interesting ways I won't discuss in this paper. Individual covariates can be analyzed with the publicly available version of the Generations data set, and so they're peripheral to my central aim of analyzing the restricted geographic data. (Most notably - and unsurprisingly - the small minority of LGBQ Republicans report low LGBT community connectness and belonging. This finding was previously reported in a bivariate analysis (Meyer and Choi 2020), but my results show that it holds up in the presence of other controls.) Others of these controls aren't associated with one or another of the outcomes, but I retain them for consistency across models.

Beyond potentially being associated with community/belonging, these individual traits vary spatially. Race is of course central to the spatial demography of the United States, and political affiliation is markedly geographically structured as well (both regional and urban/rural divides). In terms of gender and sexuality, gay men are more likely than lesbian women to concentrate in urban centers (Black et al. 2000). Education level affects opportunities to relocate, and respondents of different ages may be at different points in their life course that affect where they choose to live (e.g., younger respondents in cities, older respondents in suburbs).

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The marginal effects plots I show below present predicted values and predicted probabilities with the individual controls set at their reference categories: young white lesbian Republican women with a high school education or less. Of course, reference categories are political and theoretically important (Johfre and Freese 2021), but the choice of reference categories does not affect my main results. (Most notably, "white" and "Republican" both shift the level of LGBT belonging and connectedness downward compared to Black/Latinx or Democrat/independent, but they do not alter the interpretations of the place covariates.)

With 4 outcomes, 2 geographic levels, and 4 functional specifications of density, my main results consist of a series of 32 statistical models – although many of these models turn out to be uninformative. I model the multi-item scale outcomes (which can take fractional values) with linear regressions, and the single-item outcomes with ordered logistic regressions. For the spline functional specification of population density, I use GAM extensions of both model types (from the mgcv package (Wood 2011)). As a robustness check for the multi-item scale outcomes, I test two additional varying-intercept multilevel models grouped at the MSA level. This is not a fruitful approach, but if it had been, it would have been appropriate to recast many of the other models as multilevel models.

2.3 Results

First, I'll describe the distributions of the relevant variables, to contextualize the main statistical models that follow. Table 2.1 shows that the typical Generations respondent (47.2%) agrees that they feel a part of the LGBT community, and this corresponds closely to the overall 7-item average of 2.97 on the Community Connectedness scale. The scale is flipped, so that higher numbers represent greater connectedness, and a

respondent who agrees with every item would receive a score of 3. Consistent with the LGBT-specific trend, respondents tend on average to disagree with the notion that they don't belong to any community, and this aligns with the 4.67 average response for the 15-item Social Wellbeing scale (again, aligned so that higher values represent more positive outcomes). All four measures point to a moderately positive sense of community and belonging on average, but with enough variability to attempt to model systematic differences among respondents and the places in which they live.

Table 2.4 shows the distributions of the two key place covariates for the zip codes and metropolitan areas represented in the *Generations* study. Population densities vary widely across zip codes (sample SD = 5,200 individuals per sq. km), and a strong right skew is evident where a tail of zip codes are especially densely populated. The mean respondent lives in a zip code with 2,500 individuals/km^2, while the median respondent lives in a zip code with only 1,000 individuals/km^2. The population-weighted mean density for all populated zip codes is 1,560 individuals per sq. km, meaning that LGBQ individuals in this representative sample live in zip codes that are on average substantially denser than the American population at large. Same-sex couples are around 1.1% of the households in the average zip code represented in the study, with a slightly lower median (0.8%) and a reasonable amount of variation (SD = 1.1%). As with density, the average is higher than the population-weighted mean for all populated zip codes of roughly 0.75%. (This is shaped by the fact that 54% of populated ZCTAs recorded 0 same-sex couples in the 2015-2019 ACS time period. Because the ACS is not a census and same-sex couples are rare, many of these are not likely to be true zeroes.) On both distributions, especially percentage of same-sex couples, note that MSAs show much less variability than zip codes.

These covariate distributions shape how I model, present, and interpret my results.

Table 2.1: Outcomes

(a) Individual item outcomes

	N	%
You feel you're a part of the LGBT community.		
Agree strongly	239	17.4%
Agree	649	47.2%
Disagree	389	28.3%
Disagree strongly	99	7.2%
I don't feel I belong to anything I'd call a community.		
Strongly disagree	252	18.3%
Moderately disagree	297	21.6%
Slightly disagree	227	16.5%
Neither agree nor disagree	142	10.3%
Slightly agree	198	14.4%
Moderately agree	168	12.2%
Strongly agree	92	6.7%

Source: *Generations* study (Meyer 2020)

(a) Scale outcomes

	Mean	Std. dev.
LGBT Community Connectedness scale (1-4)	2.97	0.56
Social Wellbeing scale (1-7)	4.67	0.91

Source: *Generations* study (Meyer 2020) 37

The distribution of population densities, in particular, informs my decision to display predicted values on a log scale. For interpreting magnitudes, you can anchor on the idea that around half of zip codes are above and below 1,000 individuals per sq. km, and around half are above and below 1% same-sex couple households

Table 2.4: Place characteristics

	Median	Mean	Std. dev.
Zip codes in the Generations study (N = 1,238)			
Population density (individuals/sq. km)	1,000	2,500	5,200
Percent same-sex couple households	0.8%	1.1%	1.1%
MSAs in the Generations study (N = 217)			
Weighted population density (individuals/sq. km)	1,200	2,050	2,540
Percent same-sex couple households	0.9%	0.88%	0.23%

Source: 5-year American Community Survey, 2019

Note: Characteristics for zip codes and metropolitan areas represented in the Generations study. Values are rounded to maintain privacy. Values are weighted by number of respondents, meaning that these are the values *experienced* by the average respondent.

Two examples drawn from the full set of zip codes will provide anchor values for those distributions and help contextualize the model results that follow. These are shown in Figure 2.1. (Remember, I can't discuss which zip codes and MSAs are actually included in the Generations study.) I've chosen these examples as quantitative outliers corresponding to culturally significant places, illustrating what a place where 10% or more of households are same-sex couples actually look like.

- Zip code 94114 encompasses the Castro, San Francisco's gayborhood and one of

the most prominent gay neighborhoods in the country. 12% of households in the area are same-sex couples. The Castro is in a densely-populated residential part of the city (9,500 individuals per sq. km), and adjacent to the extremely dense downtown core of San Francisco (with densities reaching 20,000 individuals per sq. km). San Francisco is is in turn the densest part of the wider Bay Area, and one of the densest major cities in the country.

- Zip codes 92262 and 92264 coincide closely with Palm Springs, a gay resort town in Southern California. 12% and 14% of households are same-sex couples, respectively. However, as the map shows, Palm Springs is far from the most densely-populated part of the Riverside, CA, metropolitan area (population densities are 300 and 150 individuals per sq. km, respectively). In other words, it's only extreme on one place characteristic, not both dimensions. Overall densities in the area are much lower compared to the Bay Area, and more typical of the country as a whole.

These real places illustrate the plausible upper end of the range for the prevalence and abundance of LGBTQ people, proxied through same-sex couples, and two distinct points on the spectrum of population densities. In the subsequent results, moving from 1% same-sex couples and 1,000 individuals per sq. km to 10% and 10,000 individuals per sq. km is like moving from a typical zip code in the sample to a place like the Castro.

I will now describe those model results, organized as follows. I primarily discuss zip code results, and then briefly touch on metropolitan area results. Within each geographic scale, I describe first the patterns for population density, and second the patterns for percentage same-sex couple households. For each place covariate, I cover the four outcomes – first the combined scales, and second the individual questions. I close by

The Castro,
San Francisco, Bay Area, CA
San Francisco outlined in red

Palm Springs,
Riverside/Inland Empire, CA
Palm Springs outlined in red

94114

% same-sex
couples

10%

5%

0%

Density
(individuals
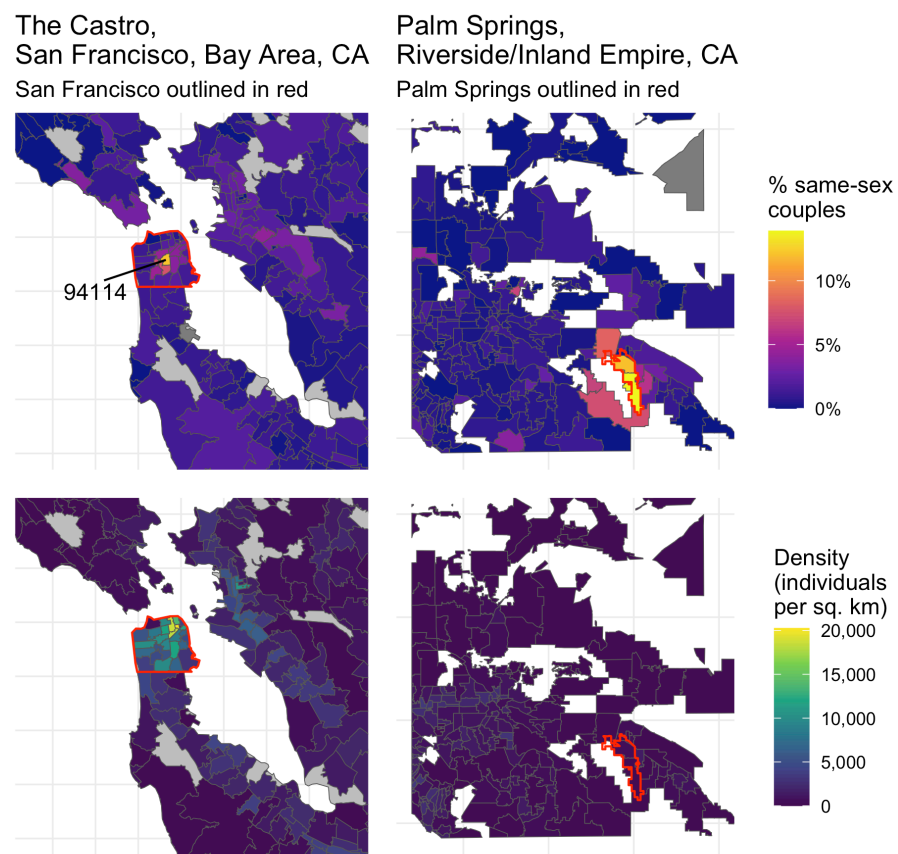per sq. km)
20,000

15,000

10,000

5,000

0

Figure 2.1: Example zip codes with high prevalence of same-sex couples: the Castro (94114) and Palm Springs (92262, 92264).

highlighting some individual-level trends for notable sociodemographic characteristics, which are independent of the place-level findings.

At the zip code level, population density shows an association with both scale outcomes, but not with the specific questions about feelings of belonging. Figure 2.2 compares predicted values for four different functional specifications for zip code population density, controlling for percent same-sex couples and individual characteristics and holding these constant at their mean and reference categories respectively. Functional form turns out to matter quite a lot; with ill-fitting specifications, it becomes impossible to estimate any clear association at all. The best-fitting models for LGBT community connectedness and generic social wellbeing have different functional forms from each other. In neither case is there any evidence for non-monotonic relationships (quadratic, spline) between density and community belonging.

Population density has a linear association with LGBT community connectedness ($\beta = 0.034$, $SE = 0.015$). In terms of predicted values (see top-left panel of Figure 2.2), this means there is little movement in community connectedness at the bottom half of the density distribution (below 1,000 individuals per sq. km), but substantial increases at very high densities. The association between population density and generic social wellbeing is better modeled as logarithmic (the third panel of the bottom row of Figure 2.2) ($\beta = 0.087$, $SE = 0.032$). An increase from very low densities (< 1 individual per sq. km) to the midpoint is associated with an increase in social wellbeing larger than from 1,000 individuals per sq. km to 10,000 or beyond, meaning that, descriptively, there are diminishing returns at higher densities. Despite being positively associated with both multi-item scales, population density is not associated with responses to either of the two single items alone, no matter the functional specification ($p = 0.16$ and $p = 0.29$ respectively). I interpret this contrast and speculate on methodological and substantive
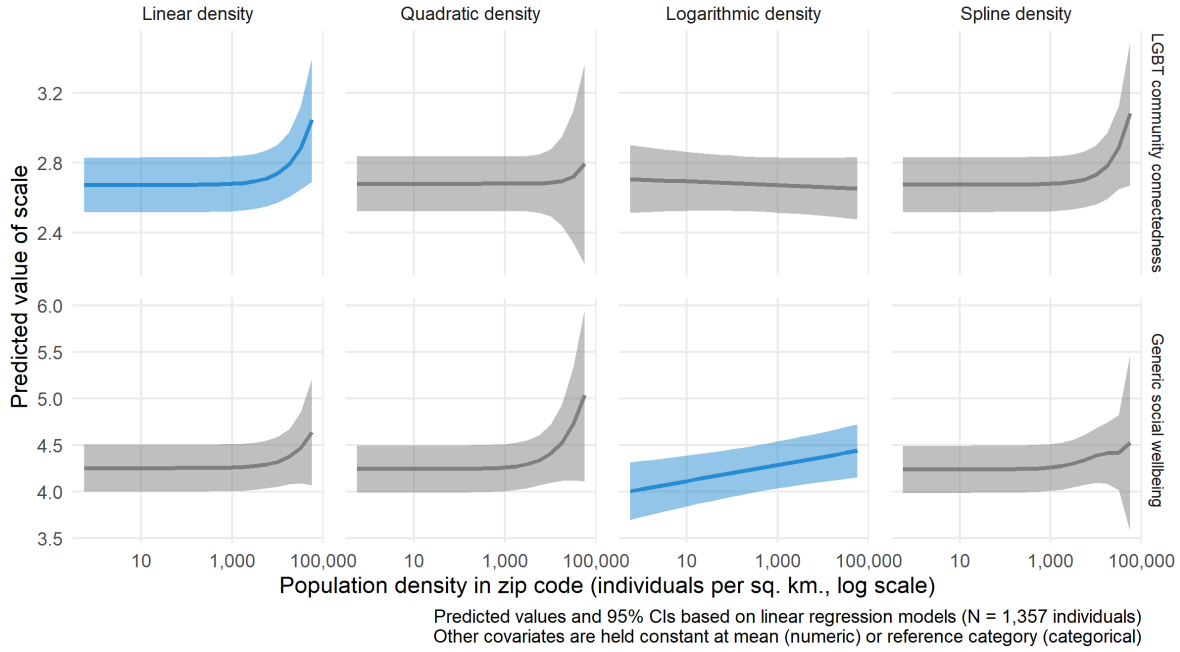
41

reasons for it in the discussion.

Figure 2.2: Predicted associations of zip code population density with LGBT Community Connectedness and generic Social Wellbeing scales, from multiple linear regression models with four distinct functional transformations. Best models are highlighted.

Across all four outcomes, a higher zip-code-level prevalence of same-sex couples is consistently associated with a greater sense of community and belonging for LGBQ people. As Figure 2.3 shows, a shift from 1% to 10% of households in a zip code being same-sex couples is associated with a quarter-point increase in community connectedness ($\beta = 2.32$, $SE = 1.41$) and a half-point increase in social wellbeing ($\beta = 5.88$, $SE = 2.34$). (The two scales have different ranges, so the units are not comparable. All models discussed here use the best-fitting specifications for density and control for individual

characteristics.) These strong associations are replicated in the individual question responses. With other characteristics held constant, the ordinal model in Figure 2.4 shows that as the percentage same-sex couples moves from 1% to 10%, the predicted probability of a respondent *agreeing strongly* with feeling a part of the LGBT community more than doubles from around 15% to 40%. The probability of disagreeing at all falls from 30% to near 10%. Similarly, Figure 2.5 shows that as the percentage moves from 1% to 10%, the predicted probability of a respondent *strongly disagreeing* with the statement that they do not feel they belong to any community also nearly doubles, to almost 40%. Given that a sense of belonging to LGBT community specifically ought to logically entail belonging to at least one community in general (although individual responses aren't always consistent), this consistency is to be expected. The overall signal that more same-sex couples in a zip code area are associated with more subjective community for LGBQ people is robust.

By contrast with those clear associations at the zip code level, there is less clear evidence to report at the metropolitan level. Among the combinations of the two covariates and four outcomes, only one association can be estimated sufficiently precisely to be distinguishable from zero. Even weighted for zip code population, MSA-level population density does not have a discernable association with any of the four community-related outcomes, with any functional form. The MSA-level percentage same-sex couple households is only discernably associated with the social wellbeing scale (shown in Figure 2.6), with a 1 percentage point increase associated with around a 0.3 point increase on the scale ($\beta = 27.63$, $SE = 11.65$). That change is of a similar magnitude to the level of change associated with a larger shift in same-sex couples described for zip codes above, but MSAs show much less variation in same-sex couple prevalence overall. The apparent direction of the coefficient for the generic community belonging item is consistent with
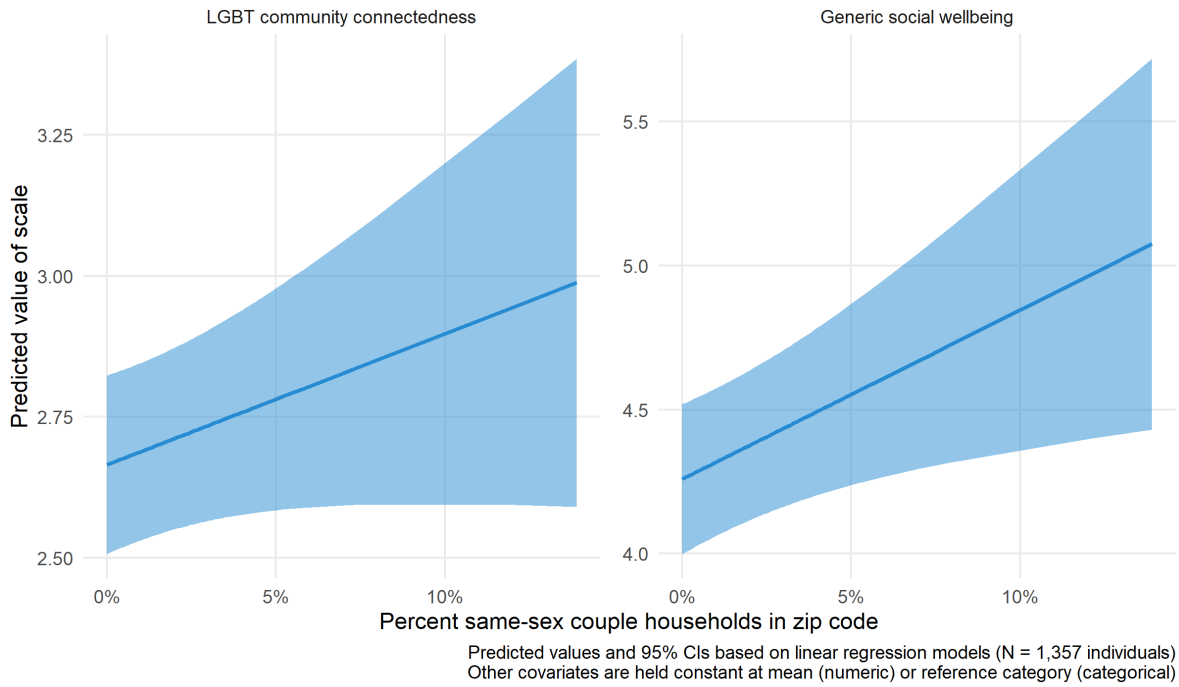
Figure 2.3: Predicted associations of zip code percentage same-sex couple households with LGBT Community Connectedness and generic Social Wellbeing scales from multiple linear regression models.
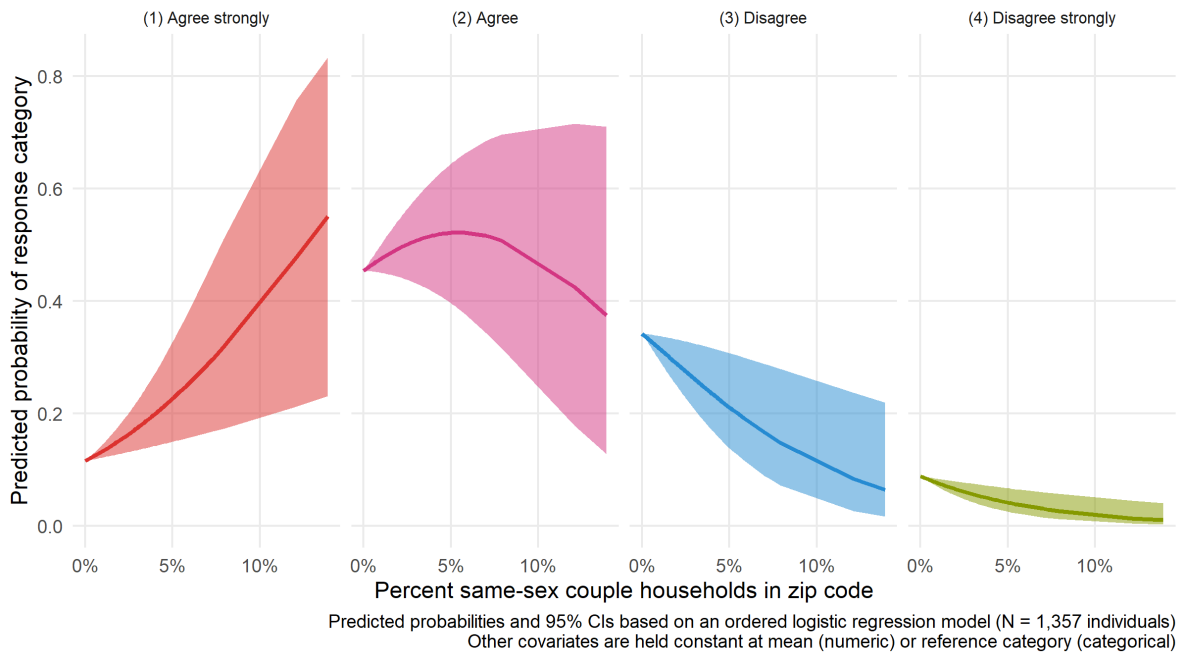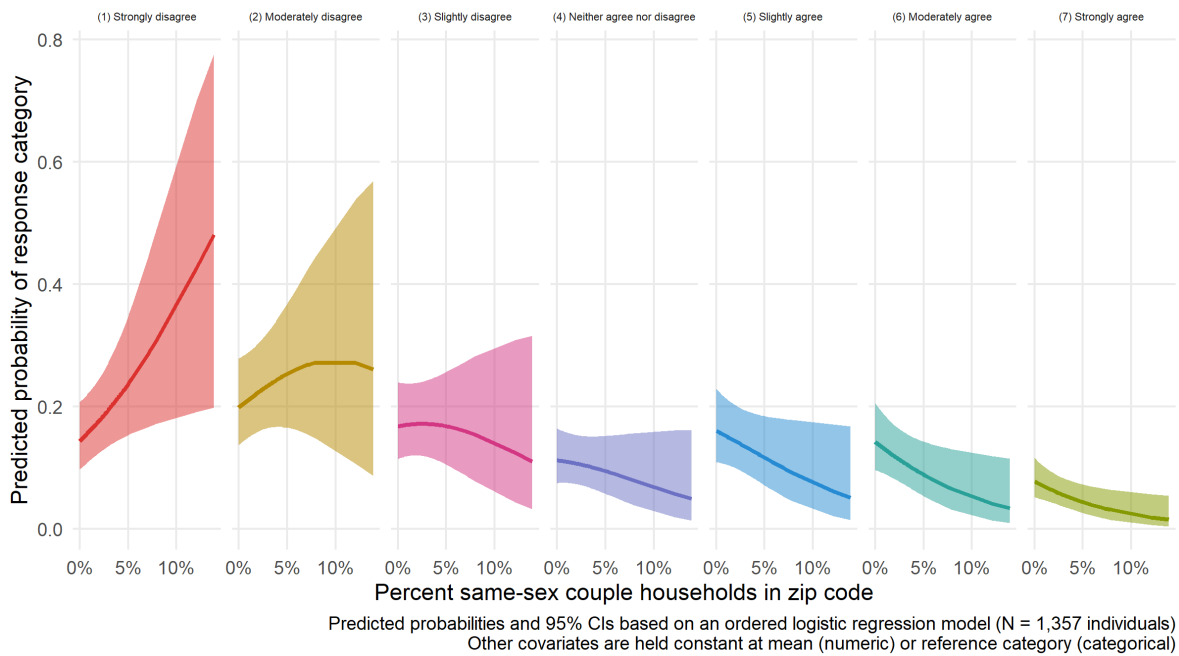
Figure 2.4: Predicted probabilities of agreement/disagreement with LGBT community belonging item by zip code percentage same-sex couple households, from ordinal regression model.

Figure 2.5: Predicted probabilities of agreement/disagreement with generic community belonging item by zip code percentage same-sex couple households, from ordinal regression model.

the social wellbeing result, but the level of uncertainty is too large to reliably distin-
guish it from zero. The prevalence of same-sex couples in a metropolitan area is not
at all associated with either measure of LGBT-specific community connectedness. As a
robustness check, even a completely different approach to capturing differences between
MSAs – a simple varying-intercepts model with random effects – doesn't reveal notable
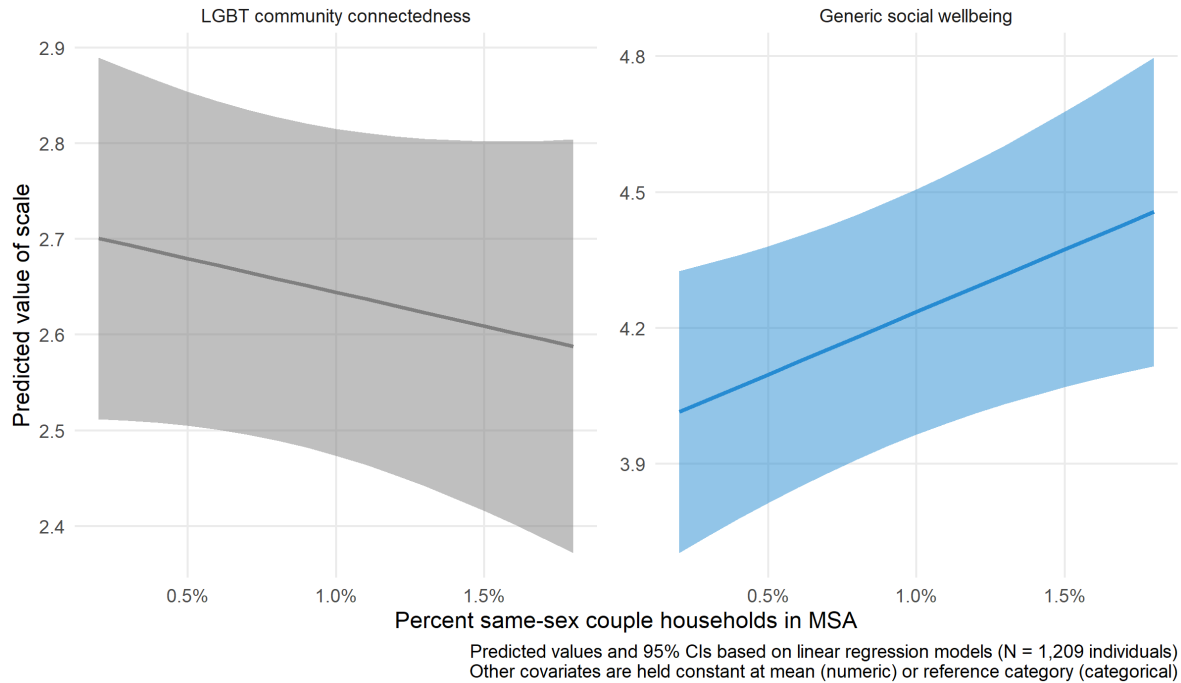between-MSA variation.

Figure 2.6: Predicted associations of MSA percentage same-sex couple households with
LGBT Community Connectedness and generic Social Wellbeing scales from
multiple linear regression models. LGBT Community Connectedness model
is non-significant.

Finally, while not the focus of this chapter, the trends for the individual-level sociode-
mographic controls are worth noting. The inclusion of the place characteristics in the

models doesn't seem to affect these associations, which makes analyzing these trends a possible avenue for future work using the public version of the Generations data set.

- **Gender** has no association with feeling a part of the LGBT community or with the LGBT community connectedness scale. However, non-binary respondents are significantly less likely to report belonging to any community and report lower social wellbeing than men or women, all else equal.

- In terms of **age**, middle and older cohorts both report feeling less a part of the LGBT community and lower community connectedness belonging than the youngest cohort, all else equal. All else equal, there are no cohort differences in generic community belonging or in social wellbeing.

- In terms of **race**, Black and Latinx respondents report higher LGBT community connectness, including feeling a part of the LGBT community, than white respondents, all else equal. For the generic questions, the direction is reversed: Black respondents are less likely to report belonging to any community than white respondents, and both Black and Latinx respondents report lower social wellbeing overall.

- Among specific **sexual minority identities**, bisexual respondents report lower feelings of LGBT belonging and connectedness than lesbian/gay respondents, as well as lower social wellbeing overall; differences between lesbian/gay respondents and other sexual minority identities are not detectable.

- As previously noted, the starkest difference in feeling a part of the LGBT community and in LGBT community connectedness overall is for **political affiliation**. Republicans report much lower LGBT belonging and connectedness than Democrats or independents, all else equal. In terms of generic belonging and wellbeing, the only statistically detectable difference is that LGBQ Democrats report

higher overall wellbeing than LGBQ Republicans. Less than 5% of respondents are Republicans, which makes the clear observed differences especially notable.

- Finally, **education** presents associations in two opposing directions. Respondents with higher levels of education report *less* LGBT belonging and connectedness but *more* generic belonging and social wellbeing, all else equal.

2.4 Discussion

Taken holistically, these results are consistent with expectations. The findings for density are weaker and more ambiguous than I might have expected, while the results for same-sex couple households come through strongly across the board – not only for LGBT community connectedness, but for general social well being as well. This speaks to the fundamental importance of LGBTQ abundance for LGBTQ people.

The evidence for population density being positively associated with sense of community for LGBQ people is moderate and mixed, and sensitive to the chosen functional specification. The best statistical models at the zip code level show either *no association* or a *monotonically increasing* association between density and community, not any more complex or inverse relationship. The lack of association for the single-item responses may be substantive – the scale differences are driven by other items on the scales – or simply due to the fact that the ordinal models have less information from which to estimate an association. Regardless, there's no evidence that small towns are good for queer community or wellbeing. This finding is consistent with a "metronormative" narrative of the historical development of LGBTQ identities, subcultures, and communities. At least for sexual minorities, cities are more of a site for Durkheimian collective coming-together than Simmelian individualism.

The prevalence of same-sex couples in a zip code has a clear, positive association with

sense of community for LGBQ people. Places with truly high proportions of same-sex couples are rare, but the models all predict that in these places respondents will report a heightened experience of belonging. By extension, I would interpret this to mean that an abundance and concentration of LGBTQ people in general would facilitate both identity-specific community connectedness and overall social wellbeing. This might seem obvious, but affective attachment to LGBT community might have been independent of or even inversely related to the actual presence of other LGBTQ people; it could have been more of a symbolic than a material phenomenon. Prior research on LGBTQ people in small cities (Brown-Saracino 2017; Forstie 2020), or on solidarity with disdain in large metropolitan areas (Winer 2020), might have predicted a different result than what I actually found. There is no sign of symbolic substitution; instead, material contextual conditions of LGBTQ abundance matter.

The example places I introduced earlier can be viewed in light of the model predictions based on their characteristics. The set of models would consistently predict the greatest sense of community in places like the Castro in San Francisco, with a high abundance of LGBTQ people in a densely concentrated space overall. Those places would be followed by places like Palm Springs, with a high prevalence of LGBTQ people in a space that isn't so dense in general. Ordinary and below-average places on both characteristics would be expected to rank below that. The importance of these durable place characteristics suggests that declaring queer spaces to be passé or viewing them as increasingly ephemeral (Stillwagon and Ghaziani 2019) may be premature. In the context of those countercurrents, such seemingly unsurprising findings might, in fact, be somewhat surprising.

Metropolitan-area characteristics appear to matter less. Inter-regional variation can't be entirely dismissed – higher MSA-level prevalence of same-sex couples *is* associ-

ated with higher general social wellbeing, after all. But there's no sign that either metropolitan-level characteristic is associated with a sense of connection to LGBTQ community. One interpretation of this is substantive; the scales that matter for queer experiences of community are not counties or MSAs but zip codes and neighborhoods. A second interpretation would interrogate the implications for measurement. Twin, interrelated features make estimation at larger spatial scales difficult. There are inherently fewer units, which reduces statistical power; and, because the units are larger aggregates, there is inherently less variability. This means any conclusions drawn from an absence of evidence at the MSA level must be taken with caution. Either way, these findings pose a challenge for future spatial work on small social groups like LGBTQ people. Even zip codes are still quite large, but it's hard to measure anything precisely at smaller geographies. And trends run in the opposite direction: the Census Bureau plans to withhold same-sex couple data below the county level in the public data released from the 2020 Census, rendering even the research I've done here impossible without access to a federal Research Data Center.

The individual-level findings have interpretations ranging from the puzzling to the expected, with some suggesting potential spatial connections for future work. In terms of gender and sexual minority identities, the most surprising findings are the lack of difference between LGBQ women and men, and between gay or lesbian respondents and other sexual minority identities. But the differences that do emerge align with intuition and prior research. Namely, non-binary respondents may find queer communities to be more gender inclusive than society at large (even if queer spaces are themselves often structured by gender). By contrast, bisexual respondents may experience biphobia and bi erasure in queer communities, while also experiencing marginalization in a heteronormative society. This is, regrettably, consistent with more negative outcomes

for bi individuals observed across other domains (e.g., Mize 2016).

The differences by both race and education present a paradox. The lower outcomes for Black and Latinx respondents compared to white respondents in terms of generic belonging and social wellbeing are consistent with an impact of structural racism and oppression; the similar trends for respondents with lower versus higher levels of education are consistent with marginalization by social class. However, in both cases, the opposite is true for the LGBT-specific measures of community connectedness. Given the realities of sexual racism and other forms of exclusion in queer communities (Held 2017; Orne 2017; Stacey and Forbes 2021), this is surprising. Altogether, there is no indication that those at the "imagined center" of the "imagined gay community" (Winer 2020) – educated white gay men – feel a greater sense of LGBT community connectedness in line with their relative privilege.

Finally, the fact that the handful of Republican respondents feel markedly less a part of the LGBT community is a strong indicator that even an identity-based community that is in many ways heterogeneous and inclusive has clear boundaries around moral values (Vaisey 2007). Of course, part of the motivation for including race, education, and political affiliation in models focused on place characteristics is that these individual traits are deeply spatially structured in their distributions, by segregation and social sorting. While the Generations study sample size is too small to uncover meaningful trends with any precision, in principle it would be generative to explore the impact of these three factors measured at the place level as well.

Returning to theories grounded in queer qualitative research, what can my results say about ambient community in a place like Ithaca, New York? Ithaca is its own micropolitan area and coincides mostly with zip code 14850, with around 2% same-sex couple households – high, but not extremely high. One possible response to Brown-

Saracino's argument in *How Places Make Us* might be that she's right – different places *are* different, with consequences for identity and community. But some of those differences are structural and can be quantified, rather than being ineffable qualitative differences in culture and identity. Those just mostly play out at finer spatial scales than cities or metropolitan areas. At broader levels, those differences wash out and become invisible.

In that vein, an especially interesting null finding is that there isn't huge variation across MSAs in a multilevel model. At the outset, I had thought I might see meaningful differences in sense of community between places if I used a better operationalization of differences in place-based cultures. For instance, future work might explore using computational text methods like topic modeling to measure local place-based cultures and narratives (Mohr et al. 2020), but my findings here suggest that city or metropolitan-level measurement might not be sufficiently granular in many cases.

Another unresolved conceptual issue I leave unaddressed here: place-based factors that are difficult to disentangle from density and LGBTQ abundance. In particular, one way future work might explore both the conditions for a strong sense of community and the form that community might take would be to measure heterogeneity and diversity within a place. Any measure of heterogeneity, however, is highly correlated with the two factors I centered in this study. Moreover, diversity is conceptually difficult to disentangle from minority abundance, as previous work by Abascal, Xu, and Baldassarri (2021) has shown. To address those challenges with any precision, a larger or more spatially clustered data set than the Generations study would be necessary.

This chapter has examined the consistencies and discrepancies between multiple measures of community and belonging, at multiple geographic scales, for a unique marginalized identity group. The representative sample of the Generations survey offers system-

aticity and breadth, even though my models leave considerable variation unexplained. These models draw attention to consistent patterns, which means they don't afford the same opportunity for nuance found in the qualitative work I've engaged with to frame my work. Future work in this vein might use these data to explore how responses related to community, identity, and other experiences fit together into overarching frames and schemas of beliefs. However, I've reached the limit of what the Generations data set can tell me about the strength, meaning, and expression of community, and so I turn to different, less conventional sources in the following chapters to explore variations in what community means and how it is expressed.

2.5 Appendix: Statistical tables

TODO: format two tables with four statistical models for zip codes and four models for MSAs. The zip code table is done but only displays in the html version.

3 Geography or Gemeinschaft?

Disentangling the meaning of "community" through word embeddings

"Community" – the literal word and the latent concept – is pervasive in everyday discourse. It appears in extremely varied and distinct contexts, everywhere from corporate mission statements to protest slogans. It's as likely to show up on neighborhood murals and graffiti as it is to star in PR materials from local banks and apartment complexes. What is it about the meaning of community that makes it so amenable to these varied uses? What might it be doing when it does appear?

One way to approach the meaning of "community" is by examining how the concept shows up in everyday social contexts. This chapter adopts innovations from natural language processing from the past decade to learn about community from how the word is used in naturally-occurring language. My approach is to systematically investigate connotations of community across text using word embeddings (Mikolov et al. 2013) – a type of model that mathematically represent words based on the contexts in which they appear. The most basic mathematical model of word meanings is an overlay of many different contexts; with some adjustments, however, word embedding models can compare different sets of contexts instead. Here, I compare a generic model trained by researchers with access to very large corpora of texts to a local and specific model that

I fit to a corpus of posts from an LGBTQ virtual community.

The foundation this analysis provides offers a bridge toward investigating two inter-related fundamental questions: first, what is going on when people literally talk about "community"; and second, what is happening when people invoke the latent social concept that the word "community" points to, whether they literally use that word or not. This effort responds, in part, to a call from Levine (2017) to investigate the power and ambiguity of "community" in contexts other than his own, where he shows how it operates as a rationale in the case of local governance; it also responds to a host of LGBTQ research that sometimes problematizes community (Orne 2017; Winer 2020) and sometimes takes it for granted (Frost and Meyer 2012). I'm especially interested in how the empirical everyday meaning(s?) of "community" might correspond to or deviate from sociological understandings of *Gemeinschaft*, of community as a meso-level form of social organization (Brint 2001; Tönnies [1887] 2001). I show that "community" in the generic sense brings together two semantic domains; in a queer context one of those connotations recedes to the background and a third domain emerges to take precedence – community-as-Gemeinschaft turns out to be the common bridge between the two.

The computational method of word embeddings offers an empirical technique that is uniquely suited for investigating these questions, because – unlike other methods for computational text analysis – they move from surface-level words to underlying meanings and their relations (Arseniev-Koehler and Foster 2022; Stoltz and Taylor 2021). While the aim of this project is descriptive and intrinsic, to provide a grounded account of the everyday social life of a social concept, it also potentially furnishes a more precise tool for measuring when social actors implicitly or explicitly invoke community and belonging – in the Gemeinschaft sense – in the course of discursive action and interaction.

I first undertake a "close read" of the embedding for "community" in a generic set of word embeddings, to understand what "community" means in contemporary English-language discourse. Then, I apply algebraic transformations to show how the spatial and sociological connotations of the word can be disentangled. In the second half of the analysis, I fit a local word embedding model to informal written text drawn from an LGBTQ Usenet newsgroup (Dame-Griff 2019). I compare how the concept of community is used in this group to the generic model.

This application is appealing for a few reasons. First, informal written text (Mc-Culloch 2019) is the most logical source for analyzing linguistic expressions of community, because it directly shows how the meaning of community is constructed through specifically social interactions. Because Usenet is an older set of virtual communities, originating in the 1980s and declining in the early 2000s, social interactions in Usenet groups were text-based, as opposed to increasingly the image-, sound-, and video-centric content of contemporary social media. Spoken language is more ephemeral and harder to collect and analyze computationally; more formal written texts like news articles – including the source text for the generic model I compare (Pennington, Socher, and Manning 2014) – are further afield from the actual experience of community. Second, while no longer widely-used, Usenet groups are one of the earliest instances of the successful creation of vibrant virtual communities – and in fact, their existence offered critical evidence demonstrating that virtual community is possible at all (Rheingold 2000). Because the preceding and following chapters draw on more contemporary cases, this historical perspective sets up a more generalizable foundation for the dissertation as a whole.

3.1 Background

3.1.1 "Community" and the meanings of concepts

Community has a power and ambiguity that render it suitable for strategic rhetorical uses in everyday discourse. Two qualitative examples illustrate the shades of meaning that "community" can take on; together, these illustrate the range of variation that I might expect to see in a computational investigation of what community means as a folk concept. First, in the context of local governance, Levine (2017) observes that "community" becomes a "floating signifier of the good," a halo of positivity to cover the real operation of local decision-making and to provide legitimacy for action. For Levine, this is harmful; he notes the impossibility of "the community" wanting one single thing as a uniform entity, and the harms of ascribing collective representational authority to whoever can show up to participatory events (Levine 2021). In his case, the word is constantly used in a positive and justificatory light, but so flexibly as to lose coherent meaning. Second, and in contrast to that wholehearted positivity, Winer (2020) finds that his interviewees have an ambivalent and distancing relationship with the "imagined gay community," drawing a distinction between "the community" at large and their own social circles. Rather than pure vagueness, this points to another specific rhetorical use, to critique an in-group's flaws rather than to justify desired actions. In these accounts, "community" assumes differing valences, with slippery or counterintuitive referents, but in each case the concept does important discursive work. I do not aim to create a taxonomy of these rhetorical strategies; instead I'll show how all of these uses together add up and contribute to the overall semantic resonance that "community" takes on. Language, after all, is social and shared (Saussure [1916] 1972); later I'll show how that shared foundation can be a springboard for understanding local deviations.

For fully understanding the social life of a complex concept, academic definitions are insufficient on their own, but worth reviewing as an anchor for comparison. "Community" is a phenomenon sociologists have elaborated on since Tönnies ([1887] 2001); they've created taxonomies of different types of communities (Brint 2001); argued over what communities count as "real" (Driskell and Lyon 2002; Rheingold 2000); and debated about what features – shared social networks/interactions or shared cultural/moral traits – are most fundamental to the creation and experience of it (Boessen et al. 2014; Vaisey 2007). What emerges consistently is the metaphor of a tightly knit social fabric, a group of people bound together by shared ties, shared culture, and possibly shared place.

However, the issue with using academic definitions of "community" as a starting point is that a strict definitional logic of concepts and categories does not apply "out there" in the real social world; classical logic may be useful for technical jargon, but it is not how ordinary human concepts work. Instead, everyday concepts are fuzzy and prototype-based (Bowker and Star 2000; Lakoff [1987] 2008, [1987] 2008; Monk 2022; Rosch and Mervis 1975; Zerubavel 2002). One way to see this is to think about how people figure out that something *is* a community in the first place. As Bruckman (2022) argues, we might decide that a virtual community like Wikipedia is a community through mental comparison to prototypes of community like a small town. A given example of community does not have to have all of a specific set of features in order to fall under the concept; rather, concepts and categories are bundles of "intensions," inherently fuzzy constellations of characteristics and cues. "Community," as an everyday concept, bundles together a spread of connotations; as I will show, the most notable of these are a geographic sense of "local place" and a sociological sense of "social group" or "object of belonging." Because "community" encompasses both, even the most mundane

use of community to refer to local place might still invoke the sentiment and connotation of *Gemeinschaft.* That is partly where the fuzziness and ambiguity of community as a concept could come from, and also part of the concept's discursive power. However, distinguishing these two senses is necessary in order to open up a window into where and how the underlying meaning of *Gemeinschaft* and belonging appears in different discursive contexts.

Finally, I'll introduce the question of the potential overlap between community and identity. Communities can be based on shared social identity characteristics (Brint 2001). In the context of the cultural sociology of markedness, Zerubavel (2018) notes that this isn't necessarily true for unmarked identity categories: "the heterosexual community" is an empty, nonsensical statement, while "the LGBTQ community" is a common and sensical one.

3.1.2 Using word embeddings to measure meaning

This project, then, uses an empirical, inductive, and computational approach to discover what community means and compare it to theoretical expectations derived from sociological literature. It integrates the sociological definition of Gemeinschaft in an iterative way, making this an abductive approach (Brandt and Timmermans 2021), rather than a purely grounded one (Nelson 2017). To examine the resonances and connotations of community in generic English discourse, word embeddings are my computational method of choice. Word embeddings are a relatively recent (Mikolov et al. 2013) computational operationalization of an old linguistic idea, called the *distributional hypothesis* (Sahlgren 2008). As Firth (1957) put it, "You shall know a word by the company it keeps." Accordingly, these models represent words as a function of all of their immediate contexts. To give one example:

"The history of all hitherto existing **society** is the history of class struggles."

(Marx [1848] 1972)

An embeddings model would take this sentence and learn about the semantic connotations of the the word "society" from its position near "history", "class", and "struggle"; it might also learn linguistic features common to nouns from its position in relation to words like "is" and "of." Naturally, a model needs many such examples as training data, to produce a single overarching numeric representation for each word in a vocabulary. There are two main commonly-used word embeddings models – word2vec, based on a shallow neural network (Mikolov et al. 2013), and GloVe, based on cooccurrence matrix factorization (Pennington et al. 2014). (The differences are minor, so I choose one or the other based on convenience, not principle.) There are many other innovations and variations on the basic method; the most interesting is a family of models called *contextualized* word embeddings (e.g. BERT), which allow for more than one vector per word, instead of a single one – of course, these models take much more training data, and are much more complex! Simpler, older models offer a more straightforward and interpretable starting point; tackling the question of what "community" means in everyday English, in practice.

A generic model with a robust, comprehensive view of as many contexts as possible would approximate "the" meaning of every word in a language. To train general models for a given language, the most common corpora are large and publicly accessible texts from the Internet, e.g., Wikipedia pages, newswire articles, social media, or anything else that can be conveniently crawled from the web. (Historical embeddings use digitized book corpora.) These pretrained models can be used for a variety of questions and tasks, but they stand in contrast to locally trained models derived from specific corpora. Of course, meanings of words do vary – over time, over space, and by other so-

cial characteristics (Bamman, Dyer, and Smith 2014; Soni, Klein, and Eisenstein 2021). A general model trained on easily-accessible data works to the extent that meanings are common or shared; of course, this flattens variation. Given the social characteristics of the authors of formal online texts like Wikipedia or news corpora, in terms of gender, race, education, nationality, etc. (Hargittai and Shaw 2015; Vrana, Sengupta, and Bouterse 2020), models trained on those data necessarily overrepresent hegemonic cultural viewpoints. This overrepresentation is a form of bias, but also a matter of substantive interest (Caliskan, Bryson, and Narayanan 2017; Garg et al. 2017; Jones et al. 2020).

Distinct from other text-as-data methods (e.g. keyword dictionaries or topic models), embeddings models create dense, distributed vector representations of words. In this way, word embeddings encode a relational model of meaning; they build up a system of signs (Saussure [1916] 1972), a vocabulary, in which distances (or their inverse, *similarity* measures) in a high-dimensional space can be calculated between every pair of words. This makes embeddings useful for social-science problems where meaning matters – especially where variations or changes in meaning are of interest; they've been applied fruitfully in cultural sociology (Kozlowski, Taddy, and Evans 2019) and political science (Rheault and Cochrane 2020). An embeddings model can be thought of as distilling shared, declarative public culture (Lizardo 2017); Arseniev-Koehler and Foster (2022) go even further to argue that the training process is a reasonable heuristic model for actual cultural cognition.

But the dimensions the models learn are not themselves interpretable (nor are they consistent across models, meaning that different embedding matrices must be aligned for comparison). To derive interpretable dimensions, social scientists use anchor words and simple algebra. One common approach is to construct new binary dimensions through

subtraction (Kozlowski et al. 2019; Taylor and Stoltz 2020), opposing pairs of concepts that can be thought of as antonyms (e.g. rich - poor, woman - man). This idea springs from the algebraic analogy tasks that first made word embeddings notable in NLP (e.g., king - man + woman ≈ queen). While these binary oppositions have a clear basis in cultural sociology (Douglas 1966; Durkheim [1912] 2001; Saussure [1916] 1972), they are not the only possibility. They don't necessarily make sense for a concept that might bundle together multiple overlapping connotations or characteristics.

Instead, in this work, I deviate and borrow a different algebraic idea from NLP: "de-biasing" an embedding through orthogonal projection away from a target word vector (Gonen and Goldberg 2019). This approach originates in an attempt to mitigate gender bias in the words for different professions and occupations – which is undesirable for NLP tasks such as machine translation (Caliskan et al. 2017), even if it represents cultural associations or demographic facts about particular occupations that might be worth studying in themselves (Jones et al. 2020). That foundational work on this method makes it clear that it does not remove all the connotations of the undesired word – i.e., it does not fully succeed in de-biasing – but it is successful enough to use to disentangle the connotations of a concept like community.

3.1.3 An early LGBTQ virtual community: the soc.motss Usenet newsgroup:

My case study is an early virtual community, an LGBTQ Usenet group called soc.motss.Usenet is a distributed system for sharing electronic messages which predates the contemporary Internet (Rheingold 2000), organized into topical groups such as alt.atheism or rec.motorcycles (to take two examples from the "20 Newsgroups" dataset (Lang 1995)). Some of these groups are reported to have had a strong sense

of community, while others were known for their hostility (Baym 1994; Dame-Griff 2019). Usenet is of interest because the time period of its heyday is when people were demonstrating that virtual community was, in fact, possible (Calhoun 1998; Driskell and Lyon 2002; Hampton and Wellman 2003; Rheingold 2000). Moreover, as boyd (2014) points out, even if particular platforms are passé, the social processes that unfold on them are not. Usenet groups are well-suited for studying the creation of community using computational text analysis methods because they are both conversation-oriented and text-based; these kinds of virtual interactions can have similar feedback effects to those associated with face-to-face interaction rituals (DiMaggio et al. 2018).

LGBTQ people may be especially predisposed to seek out (queer) community in digital spaces. The internet has long been recognized for its potential for marginalized groups (boyd 2015; Mehra, Merkel, and Bishop 2004), with LGBTQ people using virtual communities for connection and support that may be lacking in offline social spaces (Dym et al. 2019). LGBTQ groups and interests have been present and visible since the earliest virtual spaces (Auerbach 2014; Rheingold 2000), and LGBTQ people have continued to play a key role as early adopters of new technologies for digital social life (e.g., mobile and location-based platforms (Orne 2017)) through to the present day.

Soc.motss – where "motss" stands for "members of the same sex" – was oldest and largest LGBTQ Usenet group. According to a history recounted by Auerbach (2014) in *Slate*, it was founded in 1983 (as net.motss), not long after Usenet came into existence in 1980. In terms of case selection, soc.motss is worth studying not because it is typical or representative, but because it is unique and historically important. As "the first gay space on the Internet" (Auerbach 2014), it influenced the many queer spaces that would come after it; as one of the largest spaces of its time period, it provides a sufficient corpus for modeling with word embeddings.

An archived version of the soc.motss FAQ from 2001 describes the group as follows (in a section headed 'Our "we"'):

> Soc.motss serves non-heterosexual Internet communities. To signal inclusiveness, we use the acronym LGBTO, for Lesbian, Gay, Bisexual, Transgendered and Others, "others" meaning supportive straight people. The newsgroup is a predominantly non-heterocentric space where we can discuss issues of importance to our communities.

Elsewhere, the FAQ provides ample evidence that this *is* a cohesive group and a virtual community by any definition of the term. It has norms for participation, a group discursive style (Eliasoph and Lichterman 2003), and community-building events like in-person meetups ("motss.con") (Auerbach 2014; Rheingold 2000). Of course, there were other LGBTQ newsgroups, such as soc.support.youth.gay-lesbian-bi or the several trans Usenet groups Dame-Griff (2019) has already studied. These might be worth analyzing on their own terms or comparing, but it doesn't make sense to mash a bunch of possibly distinct group cultures and discursive styles together in one corpus. Soc.motss offers a well-defined, prototypical early LGBTQ virtual space.

3.2 Data and Methods

I analyze the meaning of "community" through mathematical measures of similarity in the contexts of two word embedding models – a generic pretrained GloVe model, and a word2vec model that I train locally on the Usenet soc.motss corpus – and then I compare the two.

3.2.1 Pretrained model (GloVe, Wikipedia + newswire text)

The pretrained GloVe embeddings (Pennington et al. 2014) I use were originally trained on a full English Wikipedia corpus from 2014 and a newswire corpus called Gigaword 5. A social scientist might prefer a more logically bounded population of text for the training corpus, but the more-is-better logic of training data won out. Generally, however, prior social science researchers have found pretrained embeddings to be reasonably robust, stable, and generalizable (Rodriguez and Spirling 2020; Stoltz and Taylor 2020), and I find similarly in supplemental analyses. The preliminary consensus is that these pretrained models are good enough for typical social science uses. Kozlowski et al. (2019), who use historical embeddings, suggest thinking of the associations encoded in these embeddings as coming from a "literary public" with known and unknown biases compared to the general population.

The GloVe model's vocabulary is truncated to the 400,000 most prevalent words. Many of these words are quite rare or unusual; I achieve more sensical and interpretable results by subsetting the vocabulary to more common words. In the first section of the results below, I do this by intersecting the vocabulary with a second GloVe model pretrained on a corpus of text drawn from Twitter (for 150,396 words in total).

To interrogate what potential meanings for the focal concept of "community" are encoded in this generic model, I take the following steps.

1. I decompose the local neighborhood, measured using cosine similarity, of words similar to the focal word ($N = 1000$) through principal components analysis (PCA).
2. I inspect the resulting PCA dimensions for the proportion of local variation they explain and for any potential substantive interpretation. Here, even though the embeddings in the neighborhood of "community" do not fall into discrete clusters, I cluster them with K-means to aid in interpretation.

3. I average the vectors for extreme words (N = 10) along a PCA axis of substantive interest to "debias" (Gonen and Goldberg 2019) the focal word vector through orthogonal projection.

This isn't a purely automatic process, but rather necessarily an interpretive one, so it would take a similar amount of interpretation to extend this method to other complex social-scientific concepts that appear in everyday discourse.

3.2.2 Local corpus and model (soc.motss, word2vec)

I build my local corpus and model as follows. I download a set of posts from the soc.motss newsgroup archived in the Usenet Historical Collection (UHC), hosted by the Internet Archive. This archive contains nearly 300,000 posts spanning the years 1999-2013, with a peak in the early 2000s and a continual decline in post volume thereafter (shown in Figure 3.1). According to Dame-Griff (2017), there were no systematic attempts to archive Usenet before 1995. While I investigate other potential archival sources, the UHC archive is so much larger that I do not attempt to merge sources together. (The second available archive, from Google Groups, is spotty; it has only 1,074 posts from net.motss, the first iteration of the group, for 1983-1986. The Google Groups soc.motss archive contains only 60,400 posts from 1986-2022 (though the most recent posts are entirely spam), with only 9,847 posts from before 1999-04-17, when the UHC archive begins.) Archives inherently risk being incomplete, but I believe this corpus is robust enough to characterise the culture and language of the group in the early-2000s time period.

I load and preprocess the soc.motss UHC archive using Dame-Griff's Python scripts, developed for analyzing transgender Usenet groups, strip quotes and footers from the text with scikit-learn (Pedregosa et al. 2011) tools intended for the 20 Newsgroups
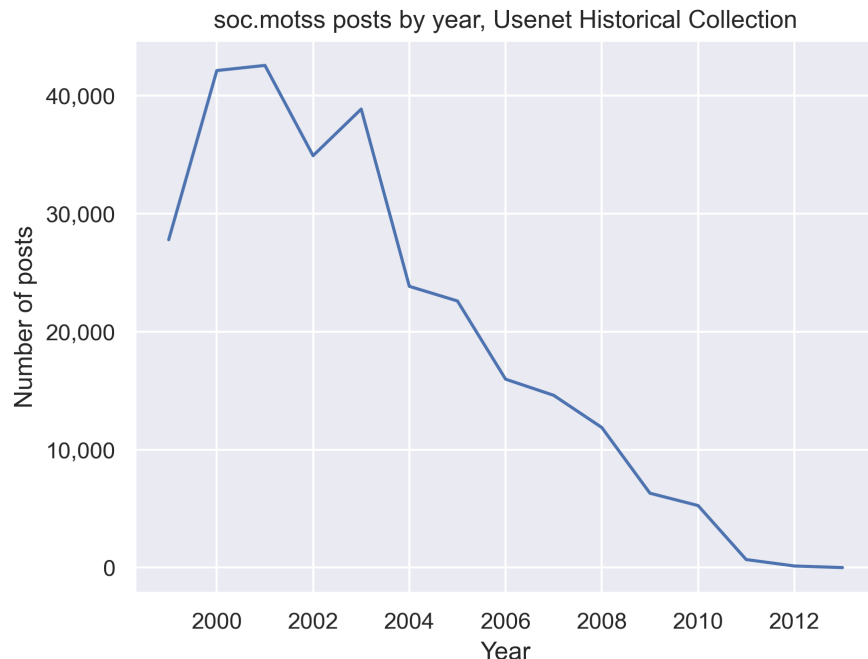
Figure 3.1: Posts from soc.motss archived in the Usenet Historical Collection by year.

dataset, and lowercase and tokenize the text with the gensim package (Řehůřek and Sojka 2010). This preprocessing is relatively minimal, but I note that any computational text analysis can be sensitive to preprocessing choices (Denny and Spirling 2016; Nelson 2017).

I fit a word2vec model to the processed corpus using gensim (Řehůřek and Sojka 2010). Key word2vec model parameters are set at a vector size of 200, a context window of 6, and a minimum word occurrence threshold of 5. I use skip-gram with negative sampling as the model architecture and train for 10 epochs. The parameter choices I make are consistent with Nelson (2021), Rodriguez and Spirling (2020), and other social science research using word2vec models. Following Nelson (2021), I also bootstrap key estimates by fitting forty new models to create a 95% confidence interval. Because Usenet posts are relatively short documents, I bootstrap posts with replacement, not

individual sentences.

After preprocessing and model fitting, there are 287,680 documents, 26,958,729 tokens, and 71,617 unique words in the final vocabulary (with the aforementioned minimum threshold for inclusion set to 5 occurrences). Of that vocabulary, 60,728 words also exist in the GloVe model's vocabulary. The words found only in the soc.motss vocabulary are largely misspellings, concatenations of words, encoding errors, foreign languages (especially Spanish), and colloquialisms (especially gay slang, Usenet slang, and emotive language).

Notably, this corpus is larger than all six trans usenet groups that Dame-Griff (2019) has archived put together, and much larger than conventional Usenet data sets like 20 Newsgroups (Lang 1995) (which uses a smaller temporal slice from more groups). It is still on the lower bound of what might be desirable for model qualtiy, but I believe my results below show that it is robust enough for broad, high-level findings. (Just don't build a chatbot based on it, I guess.)

I use three metrics to compare word embeddings, including the embedding for "community," between this local model and the pretrained GloVe model. The "query rank" correlation measure comes from Rodriguez and Spirling (2020) and is the Pearson correlation between models of within-model cosine similarities for a word and every other word in the vocabulary; they take this metric as a measure of stability and model quality. The remaining two measures come from Hamilton, Leskovec, and Jurafsky (2016a) and are two different applications of cosine distances (= 1 - cosine similarity). Their "linguistic drift" measure compares the cosine distance of the same word directly across models; their "cultural shift" measure is a second-order comparison using the cosine distance of the cosine similarities of the nearest neighbors to the word. Unlike the first measure, these two require mathematically aligning the embeddings matrices as best

as possible, using a matrix alignment method called orthogonal Procrustes (Hamilton, Leskovec, and Jurafsky 2016b).

Finally, to complement the semantic dimensions derived from the PCA decomposition of the GloVe model, I create a third semantic vector of words related to LGBTQ identity. Unlike the other two semantic dimensions, I choose these keywords by hand based on domain knowledge and manual inspection of nearest neighbors. The exact words are therefore more ad hoc and less principled, but this is not an atypical approach; it is no different from previous studies that use keywords to create vectors for concepts like "power" (Nelson 2021) or "social class" (Kozlowski et al. 2019). To match the other dimensions, I pick 10 words: 'lgbt', 'lgbtq', 'glbt', 'gay', 'lesbian', 'bi', 'bisexual', 'transgender', 'queer', and 'homosexual'. ('Gay' is the most common of these words in the soc.motss corpus, appearing 49,486 times; the rarest is 'lgbtq', appearing only 18 times.) Again, by taking an average the vector becomes more robust to the inclusion or exclusion of any given word.

3.3 Results

3.3.1 Semantic dimensions of "community" from a pretrained model

I proceed from a standard set of word embeddings pre-trained on Wikipedia and newswire text (i.e., formal, written online English) and publicly released (Pennington et al. 2014). This is a generic set of embeddings, with all of the cultural biases that that necessarily entails. Word embeddings encode a notion of similarity; a key way to understand what a given word means in a model is to examine the words that are most closely related to it. These are the words that would show up in similar contexts.

The 10 most similar words to "community" in the GloVe model are 'communities', 'organizations', 'society', 'local', 'established', 'area', 'part', 'within', 'public', and 'council'; both spatial and social dimensions are evident.

For a more robust picture of what community means, I expand my view and select the 1000 words that are the nearest neighbors to it in the vocabulary, as measured by cosine similarity. I then decompose that subset of the embeddings space using principal components analysis, which I choose for its relative interpretability compared to other dimensionality reduction methods. Table 3.1 shows the ends of the first six PCA dimensions from the nearest neighbors to "community" in the GloVe model. Each set of 10 words qualitatively shows a reasonable amount of semantic coherence, and in some cases the opposition of each end of a given dimension is also interpretable. Note that the 200 dimensions of the embeddings space encode a substantial amount of subtle information that is lost with dimensionality reduction, so the proportion of variance explained by the first several dimensions is relatively low. (Kozlowski et al. (2019) have shown similar results in an experiment with PCA and with explicit cultural dimensions, so this is unsurprising.)

Table 3.1: Top 10 and bottom 10 words for first 6 principal components, out of 1000 nearest neighbors to "community," from pre-trained GloVe model (Wikipedia + Gigaword 5)

Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
n't	cooperation	research	teach	populations	historical
we	promote	management	kids	populated	contemporary
if	governance	library	music	farming	political
do	awareness	science	teaching	areas	history

Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
get	stakeholders	facility	religion	sustainable	founding
could	initiatives	university	contemporary	infrastructure	influential
what	sustainable	provides	teacher	vast	described
know	understanding	institute	traditions	cultures	cultural
would	commitment	facilities	tradition	population	role
really	implement	program	feel	coastal	movement
...	...	...	...	...	...
baptist	district	minorities	government	alumni	families
african-american	county	refugees	infrastructure	meeting	parents
encompasses	situated	arab	aid	met	workers
nonprofit	township	settlers	region	member	employees
methodist	nearby	orthodox	regional	joined	teachers
interfaith	near	ethnic	economic	university	volunteers
lgbt	village	jews	summit	attending	residents
community-based	suburb	muslim	nations	invited	kids
non-profit	town	christians	security	attend	homes
not-for-profit	located	muslims	cooperation	attended	educate

Figure 3.2 focuses on the first two dimensions, effectively projecting the 200-dimensional vectors down into two-dimensional space. The first dimension (the x-axis in Figure 1) ranges from words like "if" and "we" and "not" to words like "not-for-profit," "community-based," "lgbt," and "interfaith." Based on the distributions of words

along these dimensions, I label this first dimension as encoding a linguistic distinction between common, functional words and words that are more complex and substantive. While important for structuring the overall space of meaning, this distinction is not relevant for my analysis (except potentially as a filtering mechanism). The second dimension (the y-axis in Figure 1), however, is more salient. Ranging from words like "town" and "located" to words like "cooperation," "governance," "organizations," and "collective," it encodes what I label a distinction between geography and Gemeinschaft. "Community" itself falls nearly in the middle between the two poles of this dimension. In the figure, I have highlighted three clusters derived from k-means clustering to aid in interpretation. The first cluster captures the functional linguistic words on dimension 1, which are not differentiated much on dimension 2; the second and third clusters separate out the more substantive words on dimension 1 into two semantic groupings: geography words on the high end of dimension 2 and Gemeinschaft words on the lower end. While there's no evidence clustering would have been a better approach than dimensionality reduction, the consistency is additional evidence that the principal components are robust.

Based on that interpretation, I select the second dimension for further analysis as representing a contrast between spatial and sociological connotations. Drawing on each end of this geography-Gemeinschaft continuum, I select the 10 words (from the 1000-word neighborhood) that are the most extreme on either end. Figure 3.3 displays these two sets of words again and shows that they do in fact fall into two distinct blocks – highly similar within each group, and highly distinct from the other group. By construction, the word "community" is highly similar to both groups – it quite literally bundles these two connotations together in a single concept. To produce a more robust vector measure for each underlying connotation of "geography" and "Gemeinschaft," I average
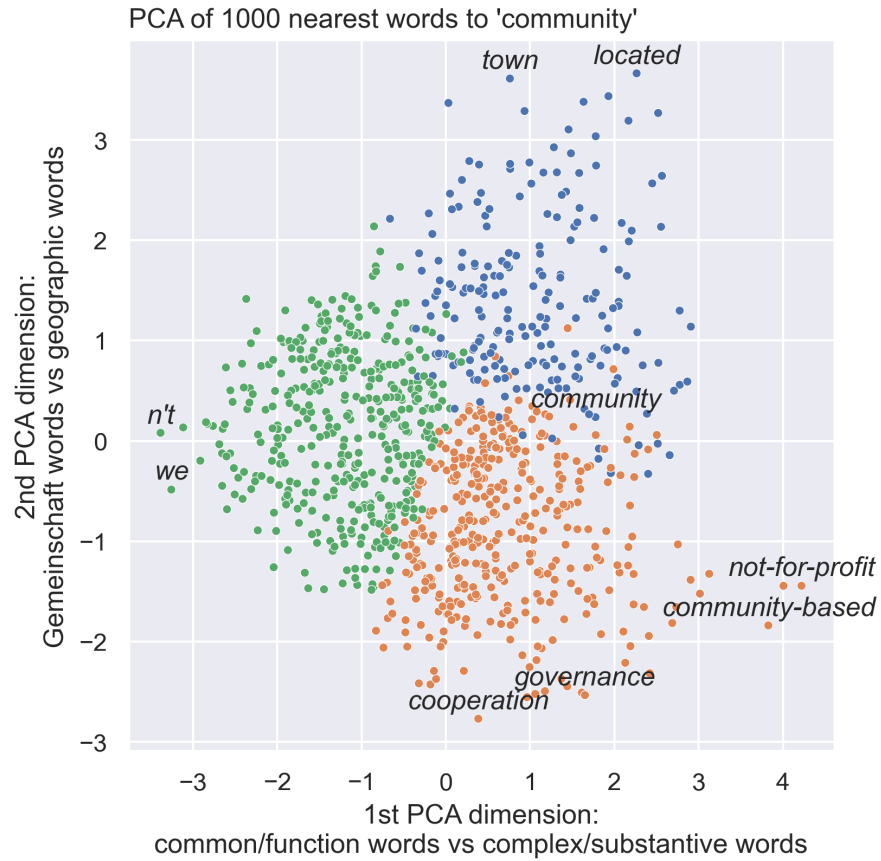
Figure 3.2: PCA decomposition of 1000 nearest word embeddings to "community", showing the first two dimensions. While the space is continuous, k-means clustering with k = 3 effectively divides it into functional words in green, geography words in blue, and Gemeinschaft words in red.

the 10 individual word vectors, as is common practice (Kozlowski et al. 2019; Waller and Anderson 2021).
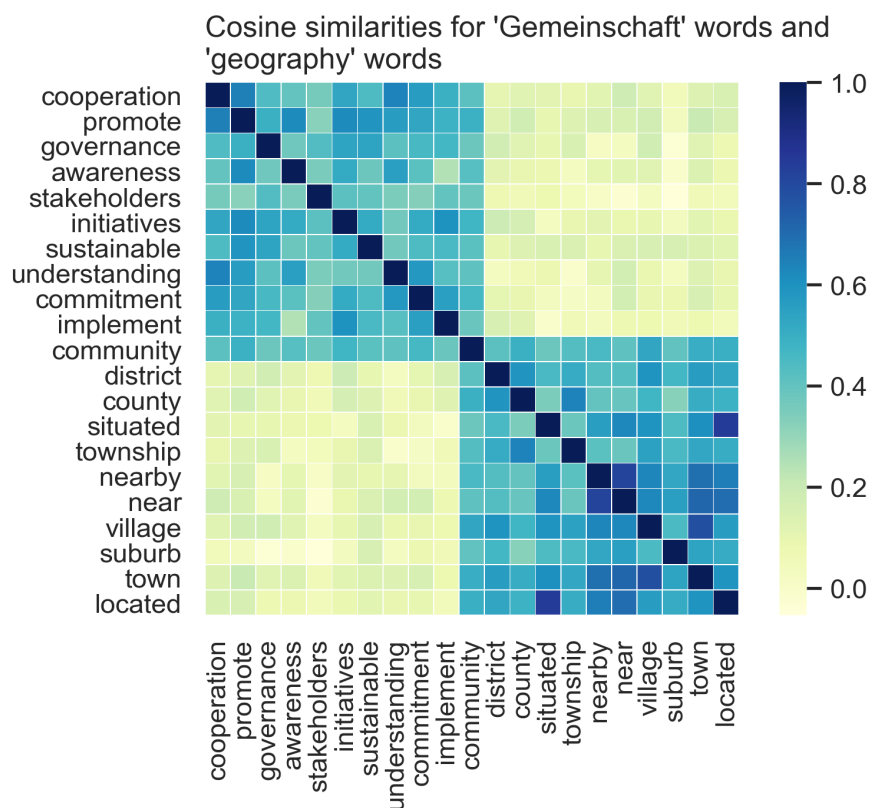

Figure 3.3: Similarities of the 10 highest and 10 lowest words along PCA dimension 2, which I have labeled geography – Gemeinschaft.

Finally, I project the vector for "community" away from the averaged geography vector (and, implicitly, toward the Gemeinschaft end of the continuum). In effect, this "de-biases" (Gonen and Goldberg 2019) the new "community" vector of those connotations, creating a new concept vector I label community-without-geography – or, alternatively, community-as-Gemeinschaft. Figure 3.4 is a two-dimensional projection of this process that illustrates the results. In the figure, the x-axis represents similarity to the new community-as-Gemeinschaft vector; the y-axis represents similarity to

the averaged geography words. By definition, each vector has a similarity to itself of 1, and the result of orthogonal projection is that the community-as-Gemeinschaft vector has a similarity to the geography vector of exactly 0. This has two consequences: community-as-Gemeinschaft remains very similar to the original community vector *and* to the averaged Gemeinschaft vector. An alternative approach – subtracting out the geography domain – does not result in a vector with the same properties. I argue that the projection approach produces an embedding that means community in a purely sociological sense, rather than a spatial one. This provides a comparative tool for analyzing the meaning of community in the context of a different corpus in the next section, as well as a more general measurement tool in ways that I will outline in the discussion.
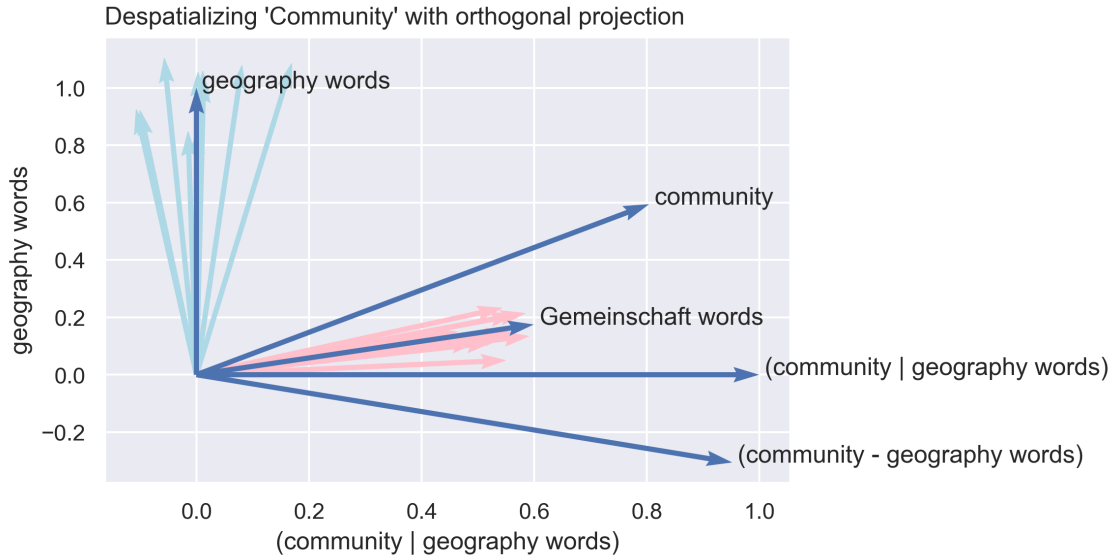
Figure 3.4: Orthogonal projection of the embedding for "community" away from the averaged vector of 10 geography-related words. The resultant embedding (community | geography) is highly similar to the averaged vector of 10 Gemeinschaft words. A binary opposition (community - geography) is shown for comparison, but is less similar to the Gemeinschaft words.

3.3.2 Semantic differences in an LGBTQ Usenet group

After fitting a word2vec model to the soc.motss corpus, I examine the neighborhood of words similar to "community" in this model, in order to determine what *community* "means" in this context and how it might differ from the more generic and general contexts that produced the GloVe model. In the soc.motss model, the 10 most similar words to "community" include words that are identical or thematically similar to words in the GloVe model ("communities," "organizations," "collectives"), words about queer identities ("glbt", "lgbt", "lgbtq"), as well as words related to religious entities: "keshet," an LGBTQ Jewish organization, and both "metropolitan" and "churches." (The 10th word is "webshots".) The similarity between "metropolitan" and "community" is *not* a geographic reference, but rather a reference to the Metropolitan Community Church (MCC), an LGBTQ-focused Protestant church.

As with the GloVe model, I then select the embeddings for the 1,000 nearest neighboring words to the word "community," and decompose this subset of embeddings with PCA. To exclude marginal words, I only include words shared between the GloVe and soc.motss vocabularies. (With more – or fewer – words overall, the PCA dimensions do not appear to remain consistent. By contrast, the PCA dimensions for the GloVe model neighborhood are more robust to different subsets of the vocabulary.) The first six dimensions, shown in Table 3.2, are considerably less interpretable than those for the GloVe model. There are some thematic groupings; for instance, dimension 2 ranges from geographic words like 'neighborhood' and 'village' to religious words like 'clergy' and 'congregations'. This dimension comes closest to reproducing the geography-Gemeinschaft continuum of the GloVe model, although the semantic scope of the words at the latter end is much narrower. Many of the extreme words are duplicated across dimensions (e.g., there are similar religion-themed words at the bottom of dimension

3), making it difficult to label them distinctly, and many sets of words are semantically mixed or contain too many rare words or proper nouns to characterize. Qualitatively, this shows that while there is some overlap with the connotations of "community" found in the GloVe model above, the same structure of those meanings cannot be discerned here. Instead, more context-specific themes start to appear.

Table 3.2: Top 10 and bottom 10 words for first 6 principal components, out of 1000 nearest neighbors to "community," from soc.motss word2vec model

Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
subgroup	neighborhood	wellness	potpourri	officials	croome
deepen	scoured	stumbleupon	ahrens	centers	activists
subgroups	village	msm	irminsul	nonprofit	activist
disparities	thrift	transgender	troth	auspices	transgender
hindered	metreon	mobilization	weintraub	lockup	parade
inequalities	wildflower	nonprofit	yahad	disparities	quintero
personhood	mayfair	disparities	badb	epidemic	lesbian
institutionalize	etobicoke	outreach	gitlin	sectors	gay
salience	telmo	visibility	pittman	courtrooms	auckland
assimilate	area	linkedin	gajic	pediatric	staged
...	...	...	...	...	...
morristown	pastors	communion	clientele	gajic	universal
metropolitan	clergy	catholics	walkable	glbt	membership
sholom	tongzhi	parishes	influx	facilitator	haifa
alejandro	laity	congregations	communities	chatroom	stumbleupon
cla	churches	unitarian	bathhouses	queer	nypl

Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
bradenton	advocacy	church	affluent	bisexual	affiliated
citywide	soulforce	congregation	areas	transgendered	metropolitan
auckland	rivalries	episcopal	businesses	newsgroup	user
rodeph	congregations	denomination	populations	poc	fellowship
montclair	interfaith	presbyterian	neighborhoods	webshots	webshots

I next attempt to use quantitative measures to systematically characterize differences between the soc.motss-derived and pretrained GloVe models. By situating the metric values for "community" in comparison to all other words in the vocabulary shared between the two models, I contextualize, in a relative sense, how different "community" is overall between the generic and specific contexts. Simultaneously, this offers a form of evaluation for the general quality of the soc.motss model – if all word embeddings shift dramatically compared to the GloVe model, we might suspect that the local model has failed to uncover anything that makes sense. For the vocabulary as a whole, the three measures are largely consistent, with moderate-to-high correlations between metrics. However, the metric values for the word embedding for "community" are *not* consistent in the amount of change they indicate:

- Figure 3.5 shows the distribution of between-model correlation of within-model cosine similarities for all 60,728 words shared between the GloVe model and the soc.motss model vocabularies. Compared to the correlations that Rodriguez and Spirling (2020) report between a pretrained GloVe model and word2vec models trained on the *Congressional Record* corpus, which range between 0.3-0.5 for randomly selected words and 0.5-0.7 for political concepts, the distribution of correlation values is somewhat lower on the whole, but in the same range. (Rodriguez

and Spirling pick out only a handful of words for comparison rather than systematically comparing every word in the vocabulary.) "Community" has a between-model correlation of only 0.151 (95% confidence interval from bootstrapped models: 0.116-0.153). This falls at the low end of this distribution and indicates only a weak association of all cosine similarities across the models.

- Figure 3.6 shows between-model cosine distances for every word, after aligning the matrix of soc.motss embeddings to the matrix of GloVe embeddings. Hamilton et al. (2016a) claim that these are a global measure of linguistic drift. The cosine distance for "community" is 0.492 (95% confidence interval from bootstrapped models: 0.471-0.560). This is substantially below the average distance of 0.672, implying that by this semantic measure community changes less than the typical word. Subjectively, these distance values seem quite high in general – in a previous experiment using historical word embeddings from Hamilton et al. (2016b) to replicate the work of Kulkarni et al. (2015), I found that the word "community" shifts by a distance of only 0.403 from 1900 to 1990. By comparison, the word "gay," which undergoes a strong shift in meaning, changes by a distance of 0.822 over the course of the same century. The GloVe and soc.motss corpora are from similar time periods, so I surmise that these differences arise from distinct linguistic styles – formal newswire and Wikipedia articles versus less formal social text (McCulloch 2019). (Different model architectures are another possibility.)

- Figure 3.7 shows what is in some sense an intermediate measure – it is also a cosine distance, but of within-model cosine similarities to a given focal word, of the local neighborhood of words around that word. Hamilton et al. (2016a) develop this "cultural shift" measure on the premise that these neighbors are semantically relevant in a way that more distance words (which were included in

the first correlation measure) are not.On this metric, "community" shows a slightly above average shift of 0.303 (95% confidence interval from bootstrapped models: 0.177-0.396, median cultural shift for all words = 0.264). The wide bootstrapped interval, however, implies that this is the least stable of all three measures.

Taken together, these measures show that "community" changes in meaning to some degree between the generic GloVe model and the local soc.motss corpus, but they offer no definitive conclusion on the comparative magnitude of that change.
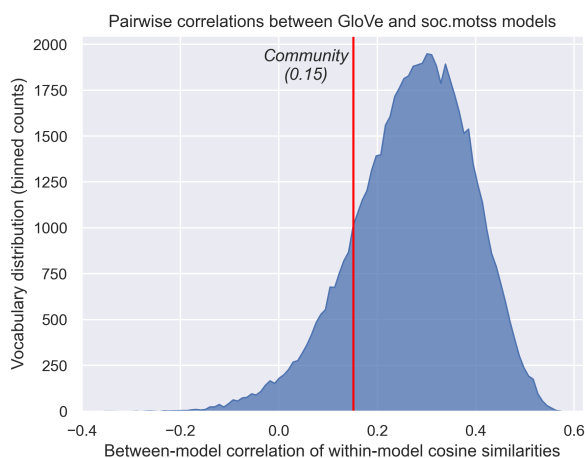
Figure 3.5: Correlation (between the two models) of (within-model) cosine similarities for every word and all other words.

The next logical question, then, is *how* does the meaning of community in the context of soc.motss differ from the generic context, and how does it remain similar? Using the semantic dimensions I derived from the GloVe model in the previous section, alongside the additional identity-related dimension I curated based on the soc.motss corpus and model, I investigate what changes and why between the two different embeddings for "community." Because these averaged semantic vectors are intrinsically more likely to be closer to the "community" vector derived from the same model, I re-create each of them
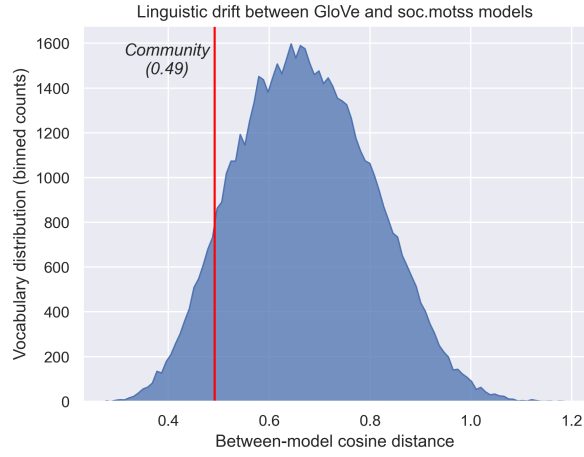
Figure 3.6: Between-model cosine distances for every word ("linguistic drift", Hamilton et al. (2016a)).
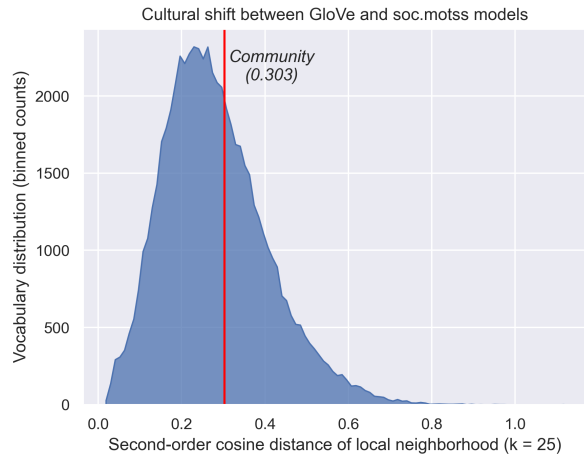
Figure 3.7: Nearest-neighbor distances, k = 25 neighbors ("cultural shift", Hamilton et al. (2016a)).

from the other model's embedding matrix, and I show both sets for consistency. The soc.motss model matrix is aligned to the GloVe model matrix, as are the 40 bootstrapped models for a 95% confidence interval (although the values from the true corpus are in at one case systematically higher than the bootstrapped values). In total, I make 12 comparisons (3 comparison vectors x 2 source models for those vectors x 2 source models for the "community" vector), shown in Figure 3.8.

This key figure shows how "community" in the context of soc.motss de-emphasizes geography but foregrounds identity instead. At the same time, it retains the Gemeinschaft connotations of community.

- When the averaged vector of geographic words is derived from the GloVe model, the gap in cosine similarities is the largest among any of the comparisons: the soc.motss embedding for "community" has a cosine similarity with the geography vector of only 0.165 (0.108-0.185), compared to 0.594 for the GloVe "community" embedding. The gap narrows to essentially 0 when the geography vector is re-derived from the same 10 words in the soc.motss model, with a similarity of 0.398 (0.374-0.437) for "community" in soc.motss vs 0.404 for "community" in GloVe – but the following two semantic dimensions have wider gaps in the opposite direction when constructed in this way.

- The Gemeinschaft vector in the GloVe model is almost identical to the geography vector in its similarity to the GloVe embedding for "community" (0.586), but its similarity to the soc.motss "community" embedding increases to 0.398 (0.374-0.437) – still lower, but a narrower gap. Recreated with the same words from the soc.motss vectors, the similarities flip: the similarity to "community" from GloVe is 0.386 (almost the same as the comparable geography vector), but the similarity to soc.motss "community" is now higher, at 0.508 (0.440-0.511).

- The averaged vector for LGBTQ identity-related words is unambiguously more similar to "community" in soc.motss than in the GloVe model, no matter which model's word vectors are used to derive it. The cosine similarities to the soc.motss "community" embedding are 0.497 (0.429-0.485) when derived from the GloVe model and 0.627 (0.585-0.641) from the soc.motss model (the highest within both sets of comparisons). These compare to similarities of only 0.367 and 0.333 for the GloVe "community" embedding respectively (the lowest in both sets of comparisons).

This approach offers clear, stable rankings and comparisons, showing that "community" in the generic sense is equally similar to both geography and Gemeinschaft, and less so to identity, while "community" as used in soc.motss carries stronger connotations of identity, roughly comparable connotations of Gemeinschaft, and weaker connotations of geography.

To bring everything together and confirm that result, the final piece involves applying the orthogonal projections from the end of the previous section. These come from the GloVe model alone, and I compare them to the "community" embeddings from both models in Figure 3.9. For reference, I also compare the two "community" embeddings themselves in the third row of the figure. As shown above, both orthogonal projections of the GloVe "community" embedding – away from the Gemeinschaft words and away from the geography words – retain high cosine similarities to the original vector, 0.810 and 0.804 respectively. This is not the case for the soc.motss "community" embedding, which is markedly less similar to community-without-Gemeinschaft (or, community-as-geography), with a similarity of 0.374 (0294-0.393). By contrast, it remains equally similar to community-without-geography (or, community-as-Gemeinschaft) as it is to the GloVe "community" embedding overall, with similarities of 0.510 (0.451-0.523) and

"Community" embeddings compared to average vectors for semantic dimensions
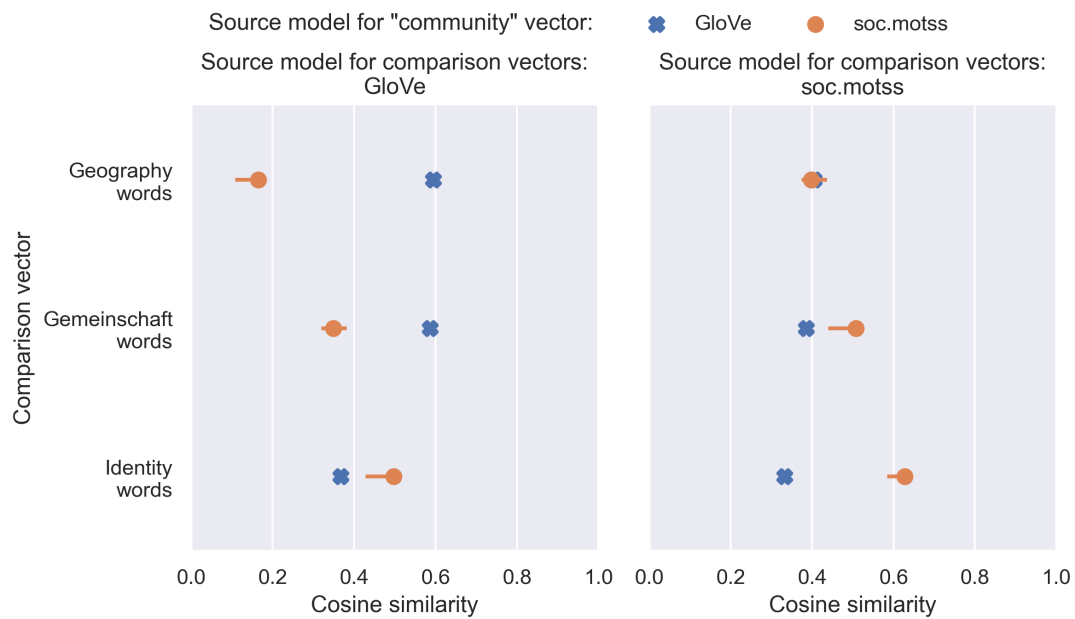
Figure 3.8: "Community" embeddings from GloVe (Wikipedia 2014 + Gigaword 5) model and word2vec soc.motss (Usenet) model compared to semantic dimension vectors based on averages of 10 words.

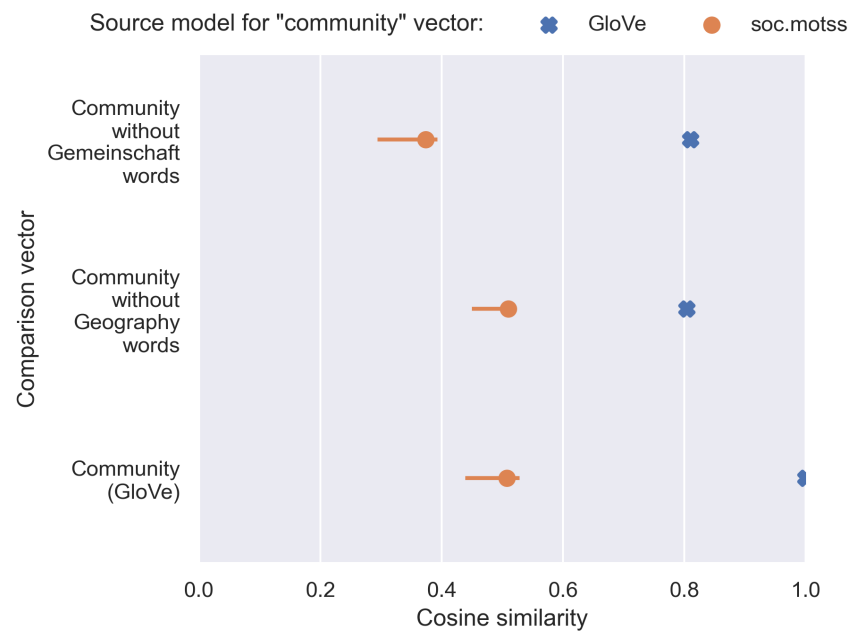"Community" embeddings compared to orthogonal projections

Figure 3.9: "Community" embeddings from GloVe (Wikipedia 2014 + Gigaword 5) model and word2vec soc.motss (Usenet) model compared to orthogonal projections of GloVe "community" embedding away from semantic dimensions.

0.508 (0.440-0.529) respectively. This is a different way of looking at the problem of semantic similarity and semantic change, and it has implications for using GloVe vectors as a measurement tool that I will explore in the next chapter.

3.4 Discussion

The structure of meaning around "community" in the generic GloVe embeddings shows, mathematically, how the word bundles and links together two sets of connotations: on the one hand spatial or geographic, and on the other hand social or *gemeinschaftlich.* This dual structure might appear intuitive, but it wasn't predictable in advance.

At the same time, this structure doesn't fully carry over into the local context of an LGBTQ virtual community. In soc.motss, the meaning of community is not totally alien or unrecognizable from the generic meaning (and why would it be?), but it is clearly distinct. Across both contexts, the sociological element of community is present in everyday usage. In the soc.motss corpus, "community" retains the *Gemeinschaft* connotations of social organization and groupness, but incorporates markedly less of the geographic or spatial connotations of community. Instead, it substitutes language related to LGBTQ identities. This case is notable in part because it comes from a time period where groups like soc.motss were proving that virtual community was in fact possible (Rheingold 2000), and it affirms the presence and visibility of LGBTQ community to that process.

Potential limitations of this work relate to robustness, scope, and generalization.While I am convinced that the findings I present here are robust, a key limitation of any text analysis work centers around corpus and model quality. It would be possible to do even more to evaluate the stability and viability of the locally-trained embeddings (see Antoniak and Mimno 2018), or to incorporate corpora from additional groups –

although there is little evidence from prior work to expect that the results would differ dramatically (Dame-Griff 2019). This work also demonstrates that there is some payoff to closely interrogating the embedding representation of a single word, provided that the associated concept has enough theoretical and empirical complexity to warrant a close read. The downside, then, is that generalizing to other complex concepts is inherently slow and requires interpretative work.

This chapter analyzed the meaning of "community" at a discursive and cultural level. While I qualitatively contextualized the social environment of Usenet and the soc.motss newsgroup, I didn't explicitly connect any social characteristics to discourse about "community." In the following chapter, I will attempt to characterize the structural, relational, and interactional characteristics of group conversations that invoke the idea of community.

3.5 Acknowledgments

4 Community talk

Interactional contexts and consequences

Building on everyone's comments and Mako's offer of data, I'll use Reddit, not Twitter, as the starting point for Chapter 3. I really liked the point about thinking about group-level outcomes, though I definitely want to think more about measurable interaction-level outcomes (even if that's just, as someone mentioned, sustained conversation). I'll need to think about the comparative logic of case more – especially the intersections of place, identity, and activities/interests. I can think of a few example papers using different kinds of subredddits that I might draw on.

4.0.1 Short version

Chapter 1 shows that when actual people talk about community they often actually mean something very similar to the sociological concept of Gemeinschaft; chapter 2 explores the conditions under which people experience a sense of community in relation to an identity category. All of this provides evidence of the reality and salience of this sociological thing called "community" for LGBTQ people. But what happens when LGBTQ people seek community out, and express community in the process? I engage

with this question in Chapter 3, by using LGBTQ virtual communities to ask who produces community talk, and what happens when they do?

This chapter will make use of the direct measures of expressions of the social and cultural aspects of community developed in Chapter 1. This will be critical because, as chapter 2 is likely to show, for LGBTQ people, feeling connected to a community is not simply about conformity or sameness. I have chosen to develop my own measure to account for this, rather than reuse existing computational linguistic measures of belonging (Lucy and Bamman 2021), which equate belonging with conformity.

As in Chapter 2, a primary question is whether pro-community factors reinforce each other, or whether community becomes ambient and backgrounded once it has been created. In this chapter, the question is whether community talk is most prevalent among those who are most embedded or central in a group, perhaps performatively creating community for downstream and peripheral group members; or, is it the peripheral members of a group that engage in the most community talk in an effort to create their own sense of belonging? Those are two distinct possibilities for the sources and the potential impacts of expressions of community.

The ideal virtual community for studying community talk would have both network and interaction measures, the contents of conversations, and their eventual outcomes. I don't think perfect data are attainable; instead, different platforms have different downsides.

Based on initial feedback, I think Twitter comes closest to most of these measures. The problem, of course, is that "gay twitter" doesn't have clear, defined community boundaries. My main idea is to use an identity symbol as a proxy for community membership and a window into the network. (Alternatives like pride hashtags might be worth exploring but seem overly inclusive.)

The fallback plan here is Reddit, which lends itself to a slightly different set of questions; Reddit conveys less information about the embeddedness of individuals in networks of people, but rather in networks of groups. (It has the countervailing advantage that some LGBTQ-oriented groups on Reddit are broader and some are more specialized.)

4.0.2 Long version

Ultimately, "community" is something that people do – they build community, they create it. This chapter aims to study how the process of creating and invoking community plays out in social networks and social interactions. Social density of interactions and relations, not mere physical proximity, produces the social reality and the individual subjective experience of community, as well as observable expressions of the same.[1] But then in turn expressions of community help create the conditions for group-based social life. Building on the discursive analysis from chapter 1, and selecting a complementary context compared to the place-based analysis from chapter 2, I aim to use virtual communities as a site to study the relation between social density and expressions of community. However, the contemporary digital platforms that provide spaces for virtual communities are vast and varied, and I need help developing and crystalizing a concrete project that connects digital data sources to some facet of the underlying theoretical process. In this chapter proposal, I'll lay out a few possibilities and articulate their tradeoffs.

The expression of community I plan to focus on is linguistic or textual, the kind of community talk or vocabulary of belonging that I explored in chapter 1. This could be explicit invocations of community and belonging that keyword methods can surface, or

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[1]In conjunction with cultural or moral density.

broader language that more generally resonates with those concepts, of the kind that embeddings models can uncover (Stoltz and Taylor 2021). Text is key partly for measurement and analysis reasons; while image, voice, and video data are all also important aspects of the online social experiences that can create or sustain communities, the computational toolkit for using those types of data are less robust and more challenging to apply. In addition to the methodological motivation, there are also important theoretical reasons to focus on text and language, especially in the context of virtual communities that produce informal written language (McCulloch 2019). There are two ways to think about text: as something that matters in itself, or as a proxy for something else. What comes out of people's mouths (or keyboards) isn't the same thing as what's in their heads. While one view might be that community-oriented language is only interesting as a proxy for the sense of community that individuals feel and perceive internally, in this case I'd argue for the importance of language on its own.This is because I think community talk can be performative, not merely expressive; what's in people's heads can't do anything in the social world unless expressed in some way, and those expressions might have consequences regardless of what individuals really feel.[2]

A couple analytic considerations shape the possible research questions I might pose. First, do I focus on the causes or consequences of community talk? The structural/interactional formation of a community and the expressions of community that emerge from and in turn reinforce that social reality are a reciprocal, self-reinforcing process that unfolds over time.[3] Because of that, disentangling cause and consequence

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[2]Of course, I can dream about having both survey measures of what someone perceives they are experiencing internally, and text measures of what they express in social contexts, in order to investigate to what degree those actually correspond, and whether "authentic" expressions operate differently from less authentic ones. I've fielded surveys through social media before, but that kind of measurement seems best left for future work. It would take resources I'm unlikely to have for my dissertation.

[3]i.e., this is a complex system. If need be, simulation might be a way to explore the dynamics better.

might be difficult. If possible, I want this chapter to focus on the consequences of invoking community, but I'm not committed to that direction yet. That focus would complement the work that chapter 1 and chapter 2 aim to do, by stepping through first what community means, then how community happens, and finally what community does. Still, it might be worth considering preceding contexts and downstream outcomes simultaneously if possible, depending on the exact form the data take.

Second, there is the matter of scale. There are two temporal scales or levels to consider when thinking about social density. Social density could be structural and relational, adhering in durable, culturally-recognized ties, like a friendship. Or it could be interactional, ephemeral, and activity-based, like a conversation. In a sense, of course, the latter coalesce into and constitute the former, or the former are an emergent, culturally-perceived (White [1965] 2008) property of the latter. The key analytic question is what each time scale lets me observe. It might be easier to observe the outcome of a conversation than to track the evolution of a friendship; it's possible to analyze networks dynamically but more likely I'll get a snapshot of a network than the full temporal dynamic. Interactions often unfold in the context of longstanding ties and/or durable groups, so taking that context into account is warranted regardless of my ultimate focal level of analysis.

With those analytic issues in mind, I'll sketch out a few potential research questions as possible scenarios, in order to make the possibilities inherent in different data sources more concrete. For instance, on the interactional level of a conversation, how might participants bring in or invoke community, whether implicitly or explicitly? People might be chatting back and forth in an amiable way that steadily builds positive emotional energy (Collins 2004), and that leads to more effusive or expressive community oriented language. Or, community might be invoked in contentious situations (perhaps by a

third party), in order to manage contention and steer people toward interactions with more positive emotional energy. In either case, what precedes those moments of heightened community-building? What's the outcome? Backing out further, to the relational level of a group, who are the people who consistently use high amounts of community-oriented language? Are they the most embedded? Accordingly, is combining network and discursive measures a way of identifying people who structurally *and* culturally play a key role in a group (Goldberg et al. 2016)? Or, are individuals on the margins the most effusive, to compensate for a lack of structural belonging and performatively create their own sense that they belong? I haven't committed yet to any one of those questions or the specific hypotheses they might entail; I expect to be able to refine and align at least one of those questions with some digital data source until they correspond well enough to constitute a feasible and interesting project.

Virtual communities provide a key site for observing how community emerge in interaction. Virtual communities are real sites for building community (Baym 1994; Driskell and Lyon 2002; Hampton and Wellman 2003; Rheingold 2000), often intertwined with individuals' offline lives as a kind of "augmented reality" (Jurgenson 2011; Orne 2017) rather than being completely distinct and separate (i.e., "digital dualism"). Moreover, the interactions that constitute virtual community building often happen *through* text (McCulloch 2019). By contrast, it's difficult to collect detailed social density data from offline interactions or ties alone (But not impossible, see Boessen et al. 2014). Another noteworthy aspect of digital spaces is that LGBTQ virtual communities are and have long been highly visible; queer people have been using digital technology to to form connections, to "find" or "build" community with each other, since the virtual communities of the 1990s, like Usenet or the WELL (boyd 2014; Dame-Griff 2019; Rheingold 2000).[4]

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[4]On sexuality and censorship online: one feature of Reddit and Twitter in particular vis-a-vis

Different digital platforms have distinct structures and affordances, which shape the ways people stage social interactions and the kinds of communities they build. Those affordances also shape the kinds of data I can collect, and ultimately mean I can learn different things from communities on different platforms. In addition, some platforms are better-studied and more convenient to analyze than others; those pragmatic considerations will also shape my case selection and project development. To make the possibilities and tradeoffs clearer, I'll discuss three platforms in detail: Reddit, Wikipedia, and Twitter. In each case, there are subcommunities of LGBTQ people to study, which have unique features but also reveal something about how each platform operates as a whole.

Reddit provides an obvious option for studying virtual communities, because the entire platform is structured around public groups (called *subreddits*). In other words, the key affordance of Reddit is the existence of groups in which to participate; these groups are the focal points for almost all interaction, which occurs in threads of posts and comments within subreddits. Posts and comments can be rated and ranked through upvotes and downvotes, providing a crowdsourced measure of quality (Medvedev, Lambiotte, and Delvenne 2018). Direct structural ties between people are deemphasized; analyses of networks of Reddit users instead focus on the web of group affiliations (Olson and Neal 2015; Simmel 1971; Waller and Anderson 2019, 2021) created by ties of subreddit co-membership. In one sense, this group-based structure means that Reddit takes "groupness" for granted – i.e., it can appear to presume the existence of real community rather than showing how strong or cohesive a given community really is.

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Facebook, Instagram, TikTok, Tumblr is that they have a more permissive stance toward sexuality (including pornography, but not necessarily other forms of sex work, especially post-SESTA/FOSTA (Blunt and Wolf 2020)). LGBTQ people frequently come up against the boundaries of censorship of sexuality on the latter set of platforms; they're on all of them, but that's a force pushing them toward the former.

Everyone who participates to any degree could be said to be a "member" of a "community", which potentially drains those words of any deeper meaning. However, subreddits vary immensely, in size and activity level, but also in moderation efforts, adherence to local rules and norms, and other signals of distinctive group styles and subcultures. Users vary as well, in their levels of participation, how specialized and selective they are in engagement across different groups, and how embedded they are in within-group conversations.

Existing research leverages some of those variations. For instance, Zhang et al. (2017) characterize user engagement across a typology of community-level linguistic features; Lucy and Bamman (2021) use contextual word embeddings to study linguistic variation and conformity and identify semantically unique communities; and Waller and Anderson (2021) study polarization of subreddits through "community embeddings" based on co-membership. In the LGBTQ context, Reddit affords opportunities to observe community-oriented language across both large and generic (e.g. r/lgbt) and small and niche (e.g. r/LesbianGamers/) groups. Based on prior work, there are methods to operationalize individual trajectories, conversation "quality" proxies, and so on.

A second, perhaps less intuitively obvious option is Wikipedia. Wikipedia is a public collective representation of knowledge, but Wikipedia is also virtual community; people can come to have a strong sense of identity as Wikipedians (Pentzold 2011). This is a "peer production" community, rather than a purely social one. But Wikipedia mobilizes and socializes volunteer labor with strong norms and rules – to the point of being bureaucratic – because coordinating the collective production of knowledge is a massive, complicated endeavor (an endeavor the academic community can relate to). On Wikipedia, individual contributors can interact but are not linked by a durable and observable network structure; still, they vary substantially in their overall degree of

investment in Wikipedia as a project and community, measurable through time and labor. My primary interest in Wikipedia would be in the backstage interactional work that takes place on the "talk" pages associated with articles, where the outcome of those interactions is the production of public-facing representations. Especially for marginalized identity groups like LGBTQ people, the external stakes of representation are high; moreover, the well-known social biases of Wikipedia in terms of gender, nationality, and so on that emerge from its community of volunteers make clear that this representation is the outcome of a social process (Evans et al. 2020).

For instance, English-language Wikipedia has a "List of LGB people." I've previously mapped the latent structure of the articles on this list, using document embeddings. As the t-SNE projection of these embeddings down into two dimensions reveals, these embeddings fractally map substantive domains (e.g., politics, sports, music), nationalities, and genders – grouping e.g. gay French writers together (Foucault alongside Barthes and Gide and Hocquenghem). Figure 8 shows a thematically labeled version of this map. (An interactive version of the figure which reveals more of its structure is hosted at https://staff.washington.edu/cgilroy/lgb_wikipedia.html). Behind this structure, however, are real people collaborating (and contending) to produce it. They produce different representations with different valences than other Wikipedias in other languages (Park et al. 2020). Other researchers have curated data and produced tools like ConvoKit (Chang et al. 2020) for analyzing Wikipedia conversations; I might leverage and connect those tools to my own methods for surfacing community language and to the ultimate outcomes of the articles resulting from backstage conversations.

Twitter, the "model organism" of social media (Tufekci 2014), is the third major option. While numerous studies based on Twitter data already exist, the platform offers clear advantages for observing community in interaction: both durable friend and

follower ties as well as interactions like retweets, quote tweets, and replies are directly observable. In addition, the absence of a clear feature for demarcating the boundaries of groups is in some sense an advantage.[5] Unlike Reddit, the structure of Twitter doesn't take "community" for granted, making Twitter a more flexible and less predetermined data source. While interactions are structured around around feeds, timelines, and hashtags instead of groups, distinctive Twitter communities and subcultures do exist – "gay Twitter" among them.

But in order to study how sense of community and social density unfold in some slice of LGBTQ Twitter, I'll need some sort of anchor. One idea I might propose is to use the adoption on Twitter of the rainbow flag, in emoji form (rainbow-flag-here), either as a window into a broader community, or merely as a way to demarcate a subset of Twitter users of intrinsic interest. While emoji in general can be thought of and analyzed in conjunction with informal written text (e.g., as a form of gesture, McCulloch 2019), rainbow-flag-here is not just any emoji. Rather, it's a symbol, and a marker of identity. While new symbols proliferate constantly and variations abound, the six-stripe rainbow flag is widely-recognized to the point that it's been formally adopted into the Unicode standard. Twitter users who adopt the rainbow-flag-here symbol as an identity marker in their bios thus constitute a visible subset of the set of LGBTQ people who use Twitter. And identity is grounds for building community: to the extent that those people belong to a distinct group or community we might call "gay Twitter", I'd expect them to be connected to each other by durable friend/follower ties and interaction-based ties like replies, retweets, and reactions. These social connections should be disproportionately dense, relative to some (as-yet-undetermined) baseline, in

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[5]Of course, there are distinct conceptual and methodological challenges around boundaries that aren't pregiven. This is one reason many studies of community, social capital, and civil society focus on formal organizations and their membership rather than informal community-building, even though formal organizations are clearly only the tip of the iceberg.

a way that network community detection algorithms or clustering metrics would be able to pick out. And from those interactions, sense of community and group culture would be evident and measurable through the same computational text analysis toolkit I've discussed previously.[6] Compared with the previous potential cases, the outcomes of interactions over time are less clearly defined, but Twitter presents an opportunity to observe a dynamic system as it unfolds.[7]

However, those three platforms don't exhaust the possibilities for using digital spaces to understand how community operates. In particular, I doubt that they're the contemporary virtual spaces that display the strongest instances of community expression and interactional dynamics. For that, I'd look instead to platforms that facilitate chat or conversation in a fluid, informal way – a dynamic, rapid temporality lending itself more toward experiences of emotional energy typically associated with co-presence in physical space. This means Discord servers, Slack channels, even Twitch streams or Gather instances or Messenger group chats. Many of those examples are more private, backstage, sometimes ephemeral, and so also offer participants opportunities to express themselves differently; maybe in a less deliberately curated way and in a way that I would think more revealing of interactional dynamics.[8] Concerns about privacy, ethics, and access limit the feasibility of exploring these alternatives now, but I would not discount them entirely.

Reddit, Wikipedia, and Twitter present three distinct options for studying social density and community language in an LGBTQ context. These platforms are conventional, well understood, and publicly accessible. This has advantages: the ethical issues

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[6]Some small fraction of users/tweets will be geolocated as well – which might present a point of connection to the chapter 2 project about place characteristics.

[7]Especially if I'm able to collect data over a long period of time.

[8]Some of these newer platforms start to bridge from informal written text to voice and video communication. That multimodality is no doubt an asset for creating a sense of community even as it renders measurement and observation much more complex.

and risks of potential additional harm are lessened when many researchers have already studied communities on these platforms, and the power dynamics of being an insider or an outsider to those spaces in varying degrees are perhaps easier to navigate as well. With these platforms, it's more likely I'll be able to construct a comprehensive quantitative picture of a process, and the ways these platforms fail to represent broader populations are also well known. Table 3.1 summarizes the relevant characteristics of Reddit, Wikipedia, and Twitter and how research projects focused on social dynamics and LGBTQ community might be developed from each of them.

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Table 3.1: Key platforms for studying LGBTQ virtual communities

Platform	LGBTQ Communities	Social density		Outcomes	Project anchor
		Ties	*Interactions*		
Reddit	LGBTQ subreddits (many)	Subreddit co-membership	Posts and comments on threads within subreddits	Conversation "quality", up-votes/downvotes	General vs specific LGBTQ subreddits(?)
Wikipedia	LGBTQ Wikipedians (language-specific)	None(?)	Talk page discussions	Conversation "quality", article representations	List of LGB People
Twitter	"gay Twitter" (porous boundaries)	Friends and followers	Tweets and replies, quote tweets, retweets	Conversation "quality", reactions, persistence of ties(?)	Symbolic anchor of rainbow-flag in bio

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4.1 Data and methods

Previously, I had examined text data from the 20 Newsgroups data set (Lang 1995), an archive of Usenet messages from spring 1993. A substantial proportion of the variation in community-like language (measured through Word Mover's Distance [WMD]), approximately 13%, was between groups. In that case, I didn't have a substantive explanation for the variation; the current work originated as part of an attempt to figure that out using a different data set with more structural information. [TODO: consider showing that figure.]

I examine the relation between interaction networks and comment text across 11 LGBTQ-centered online groups ("subreddits") on Reddit. These subreddits come from an internal taxonomy of subreddits (r/ListOfSubreddits/), referenced in Lucy and Bamman (2021). They are likely to be the among the largest, most well-known, and most general LGBTQ-themed subreddits, although there are many more. There, the groups are categorized specifically under "Communities" alongside other recognizable groups (e.g., parents, teachers, vegans, people with beards), and as opposed categories like "Discussion" and "Entertainment," suggesting that community-building will be an intentional focus in a way that is not necessarily true for all online groups. Notably, Reddit (the company and platform) itself also recognizes LGBTQ-themed groups as a paradigmatic case for on-platform community-building – their 2020 comments to the FCC in defense of volunteer moderation under Section 230 specifically choose to highlight and give voice to community moderators from r/lgbt.

I construct measures of community talk from the text of the Reddit comments. Due to their relational nature, word embeddings are well-suited for uncovering implicit references in a text. But to move from individual words to longer texts – sentences or paragraphs or entire documents – some kind of aggregation method is necessary. Multi-

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ple such methods for summing or averaging word embeddings exists; one normalized or weighted method with advocates in sociology is called Word Mover's Distance (WMD) (Kusner et al. 2015) or Concept Mover's Distance (CMD) (Stoltz and Taylor 2019). CMD calculates a distance metric between any given text and a target vector – in this case, the vector for "community". In disciplines other than sociology, simple averages of embeddings are used instead (Kennedy et al. 2021), but my brief investigations show little difference from WMD. Because I use the Python implementation of Word Mover's Distance in the gensim package, there are minor differences in the distance metric and algorithm from Stoltz and Taylor's implementation of CMD; I expect the results reported below to be robust to such minor variations. I also do not standardize or invert the values I report.

Rather than construct a latent continuous measure of distance from the concept of "community," represented through its GloVe word embedding (Pennington et al. 2014), for each comment, a simpler approach might measure the comments that explicit reference "community" (or "communities"). To contextualize this analytic choice, there is a methodological debate within the literature on computation text analysis for social science, about whether to measure surface-level, explicit keywords or latent, implicit meanings, and about the tradeoffs between each family of approaches (Stoltz and Taylor 2021). In the context of morality, Kennedy et al. (2021) use averages of word embeddings instead of WMD, but also provide evidence in favor of embeddings approaches over explicit lexicon-based approaches. For many instances where measuring culture through the meanings of text (Mohr et al. 2020) is the desired aim, I tend to agree that the latter is more appropriate. I described and used such an approach with word-level embeddings in the previous chapter. However, as I will show, issues arise when moving from single-word embeddings to overarching document-level measures. Because of this, I choose to

compare both explicit and implicit measurement approaches here.

I obtain subreddit data through ConvoKit (Chang et al. 2020), a Python-based toolkit for retrieving and analyzing conversation-based data sets. While I do not use many of the conversation-specific features of the toolkit, the format is ideal for extracting interaction and their metadata, making it easy to retrieve both textual data and the interaction network structure. (A limitation of this choice is that it would be hard to automatically generalize my data processing code to Reddit data stored in a more typical database format.) I calculate Word Mover's Distance using gensim [CITE]. I transform interaction pairs into a network and calculate network statistics using igraph [CITE], dropping deleted users and the AutoModerator (a bot). Following Lucy and Bamman (2021), I use closeness centrality as my key measure of user embeddedness in the subreddit conversation networks. (By contrast, Foote, Shaw, and Hill (2023) look at inequality in *betweenness* centrality. These two measures, plus eigenvector centrality, do not give consistent results.) Unlike Lucy and Bamman (2021), I do not restrict the user networks to the 20% of users who are most active; instead, I subset to users within the largest connected component of each of the networks. (This drops the number of users in each subreddit considerably, but users outside the largest component are almost all singletons with minimal activity in the group.)

One key measurement issue makes it difficult to use Word Mover's Distance from "community" as the sole outcome measure. When calculated at the comment level, Word Mover's Distance exhibits a systematic variation in a way that appears to make it ill-suited for statistically modeling with other variables. Specifically, short texts, especially one- or two-word texts, exhibit very high variability; longer texts converge to roughly the average value overall. This makes theoretical sense when WMD is used to compare a variable-length document to a one-word concept, as Stoltz and Taylor (2019) do with

their Concept Mover's Distance adaptation of the measure: WMD measures the effort it would take to transform one text into another, normalized for document length; in this view, single words can be quite far apart. Longer texts are a sort of average of all the words they can contain; the longer the document, the closer it becomes to what might be an average distance from, perhaps, the corpus overall. Variation washes out. I suspect this issue has not been previously reported because prior work has compared texts of roughly similar sizes, e.g., sentences, speeches, or books (Stoltz and Taylor 2019), and has compared relatively few documents. Reddit comments are highly variable in length – many are only a few tokens long, while some stretch to thousands of words, and there are millions to compare. This makes the problem quite visible, as shown in [FIGURE ID]. A simple correction might be to use weighted least squares and weight longer comments more highly; more advanced approaches might incorporate and estimate that heteroskedasticity within the model itself. Still, this ignores something fundamental about the measure itself, with no obvious solution.
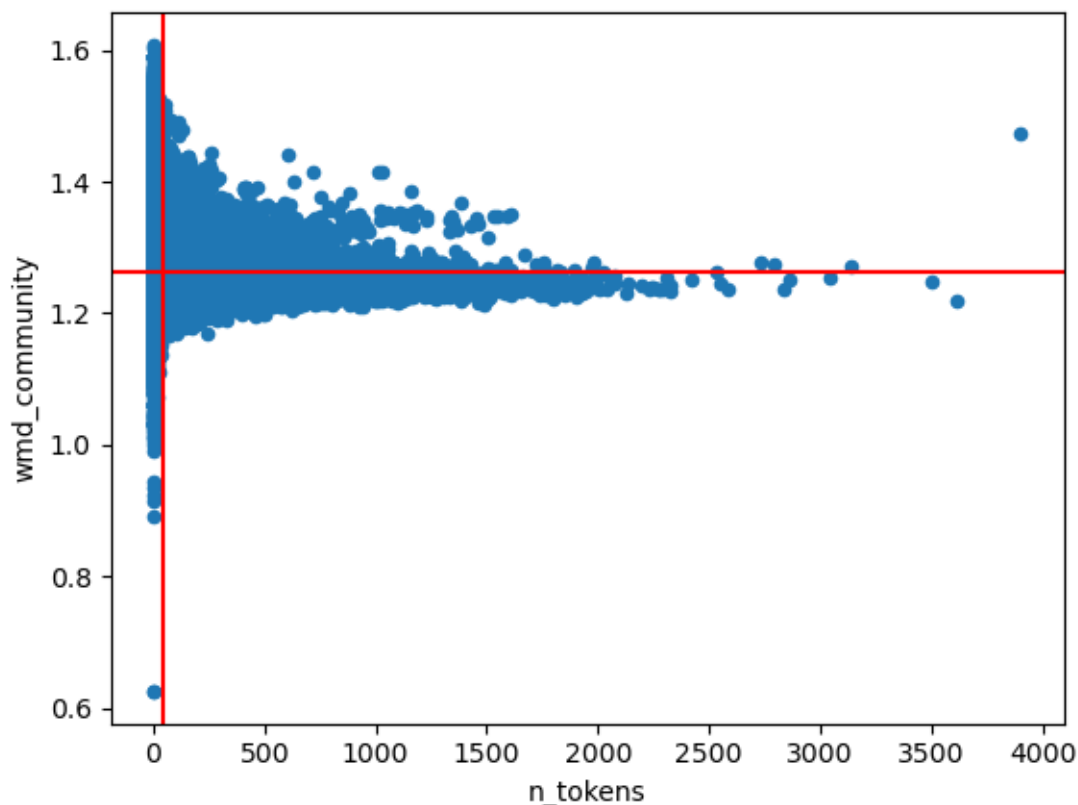
Similarly, when I average WMD values across a user's comments, the same phenomenon occurs; users with more comments have converging average WMD values. In this case, I use weighted least squares weighted by the number of comments per user. (In modeling the explicit use of "community," I control for the number of comments instead; I explore controling for average comment length.) Moreover, the network measures are calculated at the user level, meaning that differences (especially for explicit mentions of community) are diminished at the comment level. Even for users who talk about community frequently, most of their comments will not include the word.

With all of these considerations in mind, I present user-level models below. In addition to using weighted least squares to model WMD by user closeness centrality and subreddit, I use logistic regression to model the probability that a user ever writes "community" in any comment and negative binomial regression to model the number of times

a user writes comments with the word "community." (Given that the majority of users do not write about community explicitly, a zero-inflated model would be theoretically justified, but model fit metrics do not support this additional complexity.) While initially I fit separate models for each subreddit, in the final results I present a pooled model with centrality by subreddit interaction terms, which are generally warranted by measures of model fit.

4.2 Results

[TABLE ID] reports descriptive statistics for each subreddit. [TODO: unpack table with words.]

In table, present:

- % community (comments), % community (users), avg wmd

- N connected users, edges, density, avg closeness centrality

I first present model results for one large subreddit as an example, and then show the full range. While r/lgbt has more users and is the most general, r/gaybros has more comments and more edges, and thus more overall activity. Only the r/ask* subreddits (r/askgaybros and r/asktransgender) are more active, but these are intrinsically oriented toward question-answering and discussion rather than community-building per se, so it makes sense to treat them as distinct rather than representative. In any case, r/lgbt and r/gaybros show generally similar trends – which is not true for all of the remaining nine. In another signal of the robustness of my findings, the two measures of community talk, explicit and implicit, are often consistent. As with the other trends, this does not necessarily generalize to the full set of subreddits.

The models control for the number of comments per user, logged. In the context of the negative binomial model, this means that the outcome can be considered approximately as rates rather than counts. (Fixing the coefficient for log(number of comments) at 1 as an offset would be a true rate, but estimating the coefficient results in a better model fit.) This control is essential because a user's closeness centrality and number of comments are highly correlated. As [FIGURE ID] shows, there is still sufficient conditional variation to model. (However, bear in mind the constrained conditional range when viewing the model prediction figures below, which means that some predictions are beyond the scale observed in the actual data.) Other controls I considered, average comment length and membership duration, did not affect estimates of the closeness centrality coefficient, and so I exclude them here.

As is typical for online communities, the distribution of user activity is highly skewed, with a handful of users providing the bulk of interactions and many contributing only once. Accordingly, I illustrate predicted values by closeness centrality with the number of comments held at the median (6), mean (30), and 95th percentile (113) values for members of r/gaybros. [FIGURE ID] shows the results for the three models: one of implicit Word Mover's Distance from "community," and two predicting whether a user explicitly mentions community. At n = 30 comments, an increase in closeness centrality from 0.2 to 0.3 increases a user's probability of ever mentioning "community" from 25% to 31%. At n = 113, a user is predicted to mention community 1.17 times at a closeness centrality of 0.2, and 1.52 times at a closeness centrality of 0.3. The implicit community results are consistent; the average WMD of a user's comments from "community" declines as the user's centrality increases, although the meaning of the decrease is not as concrete to interpret.

[TODO: combine three figures into panels of one figure.]

Modeled at the comment level, results are much less interpretable. There is no association with closeness centrality in a logistic regression of explicit community mentions – which makes sense, given that users who mention community will also have comments where they do not. There appears to be a small *positive* association between closeness centrality and Word Mover's Distance from community ($\beta = 0.002$), in a linear model weighted by comment length; this is an order of magnitude smaller than the user-level coefficient ($\beta = $ -0.029), and so it is substantively unimportant. That the result is not consistent with the user-averaged finding suggests that weighting and aggregating may not have overcome the mathematical issues inherent in the funnel-shaped distribution of WMD values. Because these results are difficult to interpret, and because there are millions of comments across all of these subreddits, I do not pursue a pooled model at the comment level.

I next present results from combined models of all 11 subreddits, allowing coefficients and levels to vary by subreddit with interaction terms. Here I show predicted values by subreddit and closeness centrality with the number of comments fixed at 30, the mean for r/gaybros (which is, again, one of the most active subreddits). While users may actually overlap between subreddits, centralities and text measures are calculated on a per-group basis, meaning that observations are actually user by subreddit. [FIGURE ID] shows predicted probabilities from a logistic regression of whether a user ever mentions "community" in a comment. [FIGURE ID] shows predicted counts of the number of comments mentioning community that a user makes (again, effectively rates, given that a user's total number of comments is controlled for). Finally, [FIGURE ID] shows predicted WMD from "community" in a linear regression weighted by number of comments.

Logistic regression: does a user ever use the word "community" in a comment?

Predicted probabilities of ever_says_community
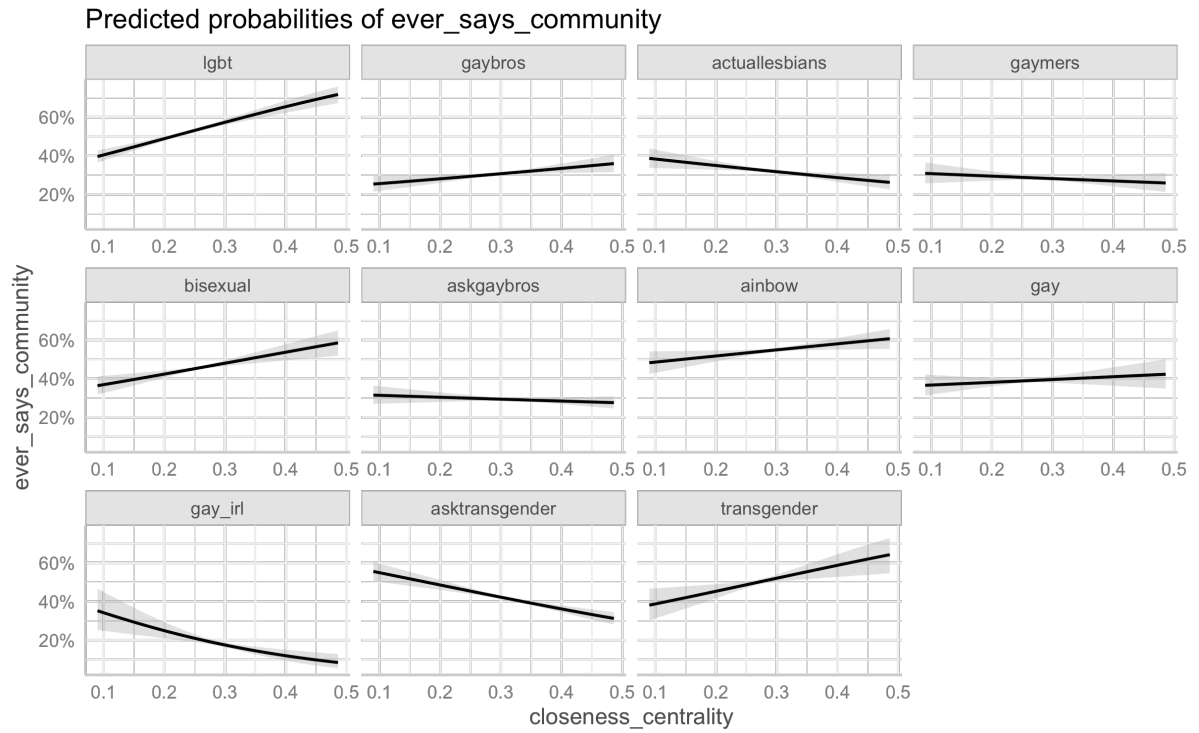
Negative binomial regression: how many times does a user use the word "community" in a comment?

Predicted counts of says_community
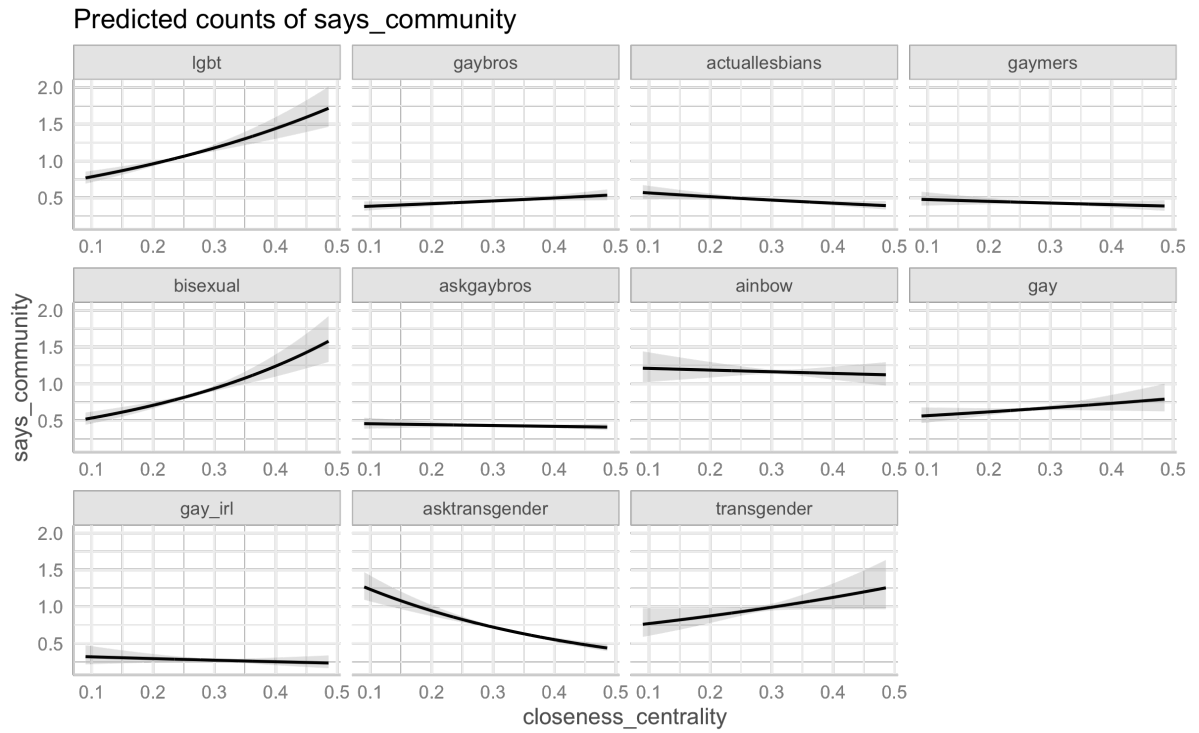
Weighted least squares: Word Mover's Distance from "community" (smaller = closer to community).

Predicted values of wmd_community_base
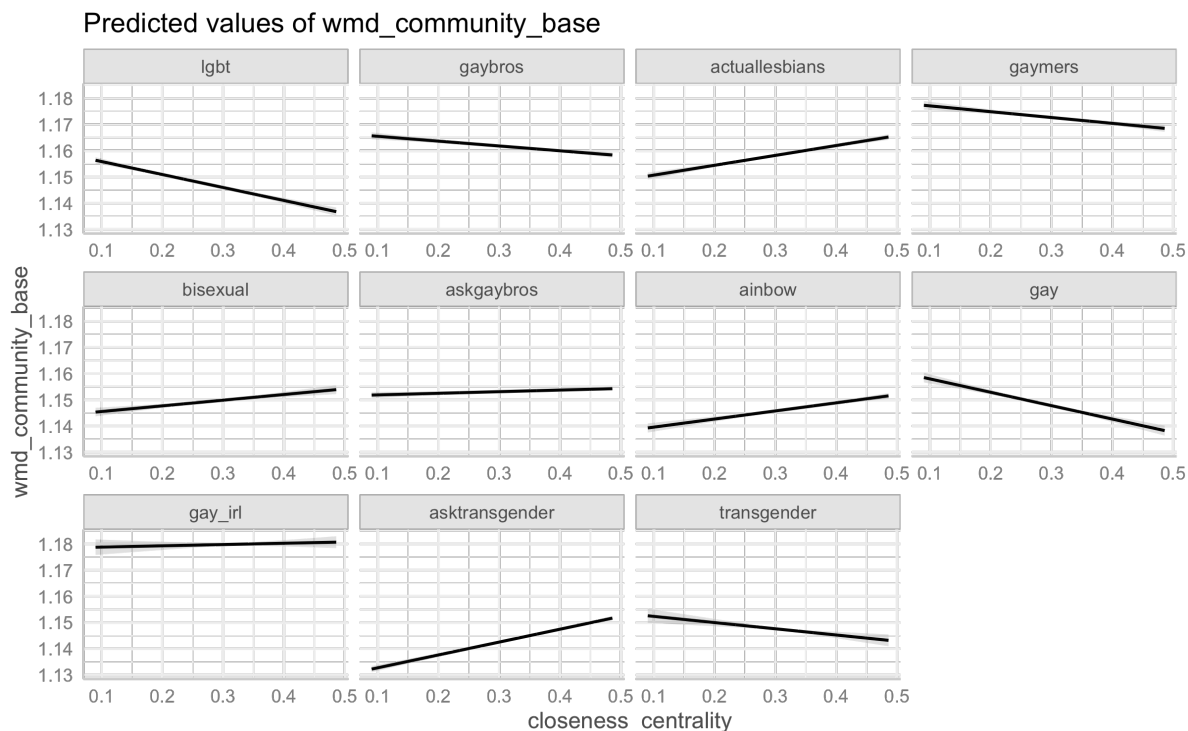
Rather than consistency, these results show considerable variation in levels and trends. r/lgbt aligns in direction with the previously described results for r/gaybros, although it tends to have higher predicted values of community overall (consistent with the much higher proportion of comments explicitly mentioning community, 3.5% compared to 1.5%). r/ainbow, a split from r/lgbt with a looser moderation policy, does not show consistent trends, neither across the three outcomes nor with the other subreddits. The r/gaymers group aligns with r/lgbt and r/gaybros on the implicit community measure, but shows little association on the explicit measures. There is no particular pattern among the groups for specific identities under the LGBT umbrella (r/actuallesbians, r/bisexual, r/gay, r/transgender); all except r/actuallesbians show increasing probabilities and rates of explicit community talk with increasing closeness centrality, but implicit community WMD values go in both directions. The two question-and-discussion groups, r/askgaybros and r/asktransgender, show inverted or no associations between commu-

nity talk and closeness centrality. Finally, the subreddit with the fewest mentions of community and highest WMD, as well as the fewest tokenizable comments overall, is r/gay_irl, which shows a declining pattern of explicit mentions of community with closeness centrality. This subreddit is for memes, which may provoke different types of discussion and which also heavily incorporate images, a medium not accounted for by the text-centric methods I use.

4.3 Discussion

What seemed like a potentially coherent empirical signal in the context of a single subreddit loses narrative coherence across the other ten. What might it mean that the signals are so mixed? The fact that I observe so much variation – even among groups for similar purposes, even among similar identities – leads me to expect to see even more variation if I were to widen my lens to other popular and active groups on Reddit.

One interpretation is that the structure of interactions in online groups does not have much bearing on the production of community-oriented talk. This negative finding might be surprising, but it would align with other recent work on the network structure of virtual communities. First, Lucy and Bamman (2021) find, also using subreddits as data, that use of distinctive in-group language – which they take to indicate belonging – is not predicted by user centrality. Second, Foote et al. (2023) find that multiple network measures do not predict successful outcomes in peer production communities; because those groups are organized around work and information, rather than community-building per se, it remains surprising evidence for generalization that I observe such heterogeneous and unclear results in a more purely social context.

Another way to view these results is to cast doubt on how I've operationalized "community" from text-based signals.Text analysis involves an overwhelming number of an-

alytic choices, and researcher degrees of freedom are known to be a serious problem for reproducibility and validity (Lucas et al. 2015; Nelson 2019; Wilkerson and Casas 2017). In particular, I have shown reasons for concern when moving from word-level analyses using word embeddings to aggregating to document-level analyses using methods like Word Mover's Distance, and I believe the mathematical properties of these aggregate measures need to be better understood before they are more widely adopted. This methodological work might look similar to prior work assessing the validity of word embeddings at the micro scale (e.g., Antoniak and Mimno 2018; van Loon et al. 2022). To mitigate those concerns, I used a very simple keyword-based approach (Stoltz and Taylor 2021), and am most confident in my findings where those two measures align with each other. Still, my results were not terribly robust when I extended them to a wider range of subreddits for evaluation.

Is talking about community the same as creating it? Not necessarily. To complement this cursory investigation, I have a few suggestions that might be taken up in future work. My initial qualitative explorations showed that even this small collection of outwardly similar subreddits varies substantially in their orientations (e.g. in attitudes toward community moderation, types of content that it is normative to share, etc.). Qualitatively examining conversations that appear to be about community (implicitly or explicitly) and the trajectories of users engaged in those conversations might uncover potential dynamics or mechanism at play. Rather than broadening the scope of analyses, more granular and contextualized quantitative analyses might be worth pursuing. If the micro-, user-level findings are not consistent, it strikes me unlikely that aggregating to macro-, group-level outcomes would reveal anything systematic and meaningful. I skirted over the temporality of the network structure and treated it as static, but interaction networks are dynamic and both individual and group trajecto-

ries change over time; incorporating that information might sort out the circumstances under which community talk might be either a cause or a consequence of structural features of groups.

5 Conclusion

[TODO]

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