IGC Report

Social, Political and Economic Networks in the Slums of Jaipur and Patna

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Introduction

Over the last decade a host of economists, sociologists, statisticians and social network analysts have been developing a body of knowledge on what features of networks, i.e., of social context, matter for human well-being. The key insight of this body of work is that the structure of community relations forms an underlying social safety net. The basic point is that challenges of economic resilience and local governance happen in particular communities that hugely vary in their internal organization, capacity for problem solving and collective action. Similarly, just as local communities have distinctive social, economic and political networks tying together their members, economic and governance systems have network ties that bind citizen/service users with neighborhood leaders, frontline providers, administrators and political officials.

As such, a household's ability to weather unanticipated health, economic or political shocks depends in large part on their ability to draw on a rich fabric of social support from friends, family, community members and local neighborhood leaders. The social capital embedded within the networks that span communities provides an underlying structure that can carry key information, provide emotional support, mobilize resources in the face of challenges, and coordinate action in times of crisis and distress. Research on social networks provides a rigorous means of thinking about and understanding many important development challenges, including: the conditions under which neighbors provide mutual support in times of crisis, when local communities are resilient in the face of external challenges, how to measure and promote social capital, how to promote accountable relations among networks of citizens, frontline service providers and bureaucrats, etc. Advance knowledge of these characteristics of local networks can provide insight into when community members can successfully mobilize internal support and/or coordinate external demands for public services from city and state governments.

To date, research on social networks has focused much of its attention on neighborhood, online and educational communities in rich countries. Building on a rich body of research on social capital, recent work has begun to explore the role of local networks in shaping household outcomes in poor communities. One noteworthy recent project examines the role of social networks in dozens of Indian villages (Ambrus, Chandrasekhar, and Larreguy 2014; Chandrasekhar, Kinnan and Larreguy 2016; Banerjee, Chankrasekhar, Duflo and Jackson 2013), showing that information flows more extensively when diffused through individuals that are more central to village networks and that social hierarchy and social distance within village networks militate against cooperation.

To date, however, we have very little rigorous data on the structure of social networks amongst the urban poor. This represents an important lack of basic knowledge about how the urban poor socialize and solve problems. Since we know that slum dwellers and the urban poor often suffer from poor or non-existent social services, it seems very likely that there is substantial informal, mutual insurance. Likewise, standard stories of "vote banking" imply a social approach to voting, and several studies of urban labor markets suggest that economic networks play an important role in job searches. Research is only beginning to reveal the rich social, political and economic networks that constitute and shape the lives of the billion-plus urban poor.

We provide an initial characterization of social, political and economic networks in eight slums in Jaipur and Patna, where we conducted network surveys. These eight slums were chosen to produce variation on two key dimensions--size and social heterogeneity. Budget and practicalities precluded the possibility of running networks surveys in large slums; given concern that key features of social networks might vary with settlement size, we chose to focus our efforts on similarly size slums with less than 625 households. Likewise, since much of the literature on social capital, social networks and collective action emphasizes the role of social heterogeneity as a constraint on interactions, we chose communities that ranged from homogenous to very heterogeneous in terms of religion and caste composition. The data on slum population and social characteristics were derived from the household sample survey we conducted as part of the the IGC-funded project "Social Networks, Property Rights and Public Services in the Slums of Patna and Jaipur".

Once the eight slums were chosen for network surveys, we pursued a demanding process of, first, conducting a census of all residents of the community, gathering the names of residents, and programming those names for subsequent use; and second, asking household respondents a set of 23 questions bearing on social, political and economic ties with individuals in their settlement; these questions asked respondents to provide the names of individuals they socialized with, talked politics with, would go to with problems, who helped them find jobs, etc. Following standard practice in research on networks, we interviewed one adult in every household in the eight slums we studied. This required multiple follow up visits in cases where no adult was initially home. The response names are crucial to understanding social networks; when the same individual is named by multiple respondents as a solver of problems (be they social, economic or political), that frequently-named individual becomes a central node in the social network. Relying on the pre-programmed names gathered in the slum census, we are able to tie respondents to those individuals they are connected to across these networks. Obviously, we cannot make broad claims about slums on the basis of evidence from these eight settlements, but the unique richness of the relational data gives us the opportunity to learn how thousands of residents rely on each other to solve day-to-day challenges.

In presenting the data below, we provide traditional descriptive data and network graphs. The network graphs are directed, meaning that connections run from the survey respondent to the person whom s/he names. Nodes can be connected by multiple links in either or both directions, if respondents name someone else for multiple questions, or if respondents name each other. The network graphs were constructed by concatenating the edgelists from several questions

pertaining to social, economic, and political networks, respectively; the specific questions are listed below in each section.

Each graph is characterized by two metrics: modularity and edge density. *Modularity* captures the extent to which the networks are "segregated" by an attribute; in Patna we focus on caste as the attribute of interest, while in Jaipur we focus on religion. The basic question is: How do religion and caste impact social, economic and political relationships among slum residents? *Modularity* scores range from −1 to 2.1; it is positive if the proportion of within-group links is higher than would be expected by chance; as the score increases, the network is more segregated. *Edge density* gives the ratio of the number of actual links to the number of possible links; it provides a measure of how "tightly-knit" a network is. Networks that are more tightly knit have higher *edge density* scores. It should be noted that the network plots exclude "isolates", or unconnected nodes for the sake of clarity; isolates are respondents who did not name another resident for any of the questions discussed below. The isolates are, however, included for the purposes of calculating network modularity and edge density.

Descriptives

Table 1 gives demographic summaries for the eight slums.[1] Household median income is in rupees per month. Clearly, this is a heterogeneous set of settlements. Jaipur 68 and Patna 51, for instance, are 100 percent Hindu, even as they vary in the share of the population that is SC and ST. On the other hand, Jaipur 145 and Patna 42 are two religiously diverse settlements. Likewise, while the settlements in Jaipur are, on average, richer than those in Patna, there is a lot of heterogeneity within cities--median income is ⅔ higher in Jaipur 68 than it is in Jaipur 145.

Table 1: Neighborhood demographics.

Neighborhood	N	Muslim %	Christian %	SC/ST %	Median Income
Jaipur 1	369	3	0	22	10000
Jaipur 30	435	22	0.2	20	12000
Jaipur 68	176	0	0	98	15000
Jaipur 145	621	54	0	25	9000
Patna 42	167	40	0.6	10	10000
Patna 51	221	0	0	22	8000
Patna 82	417	17	0	80	7500
Patna 93	183	1	0	24	9000

Table 2 shows the network modularity and edge density for the three network types in each of the eight slums. It should be noted that modularity is calculated on the basis of religion (Hindu/Muslim) in Jaipur, and caste (General, BC, and OBC versus SC/ST) in Patna. The table provides some important initial findings. First, there is a lot of variation across slums in how tightly knit (modularity) and segregated (edge density) they are. Second, it is not obvious that more heterogeneous slums--on either religious or caste composition--are more segregated or

[1] We have given the slums numeric names to preserve their anonymity.

less tightly knit. Jaipur 68, for instance, has the most segregated (edge density) social and political networks of any slum, despite the fact that it is the single most homogenous slum in our sample. Likewise, Jaipur 145 has the most tightly knit social and political networks despite being one of the most diverse settlements. Third and finally, it is important to note that social, political and economic networks *within* slums are quite different from each other. As will become clear in examining the network graphs below, social networks are typically more dense than political networks, and political networks are more dense than economic ones.

Table 2: Network metrics.

	*Edge Density*100*			*Modularity*10*		
Neighborhood	Social	Political	Economic	Social	Political	Economic
Jaipur 1	0.62	0.19	0.13	0.01	-0.03	-0.07
Jaipur 30	0.51	0.31	0.14	2.07	1.48	2.12
Jaipur 68	1.43	0.94	0.3	0	0	0
Jaipur 145	0.42	0.12	0.07	3.69	1.53	3.28
Patna 42	1.5	0.33	0.33	0.74	-0.08	0.71
Patna 51	1.05	0.07	0.29	1.19	0.97	1.65
Patna 82	0.58	0.36	0.09	1.81	-0.01	1.17
Patna 93	1.29	0.69	0.31	1.81	0.39	0.68

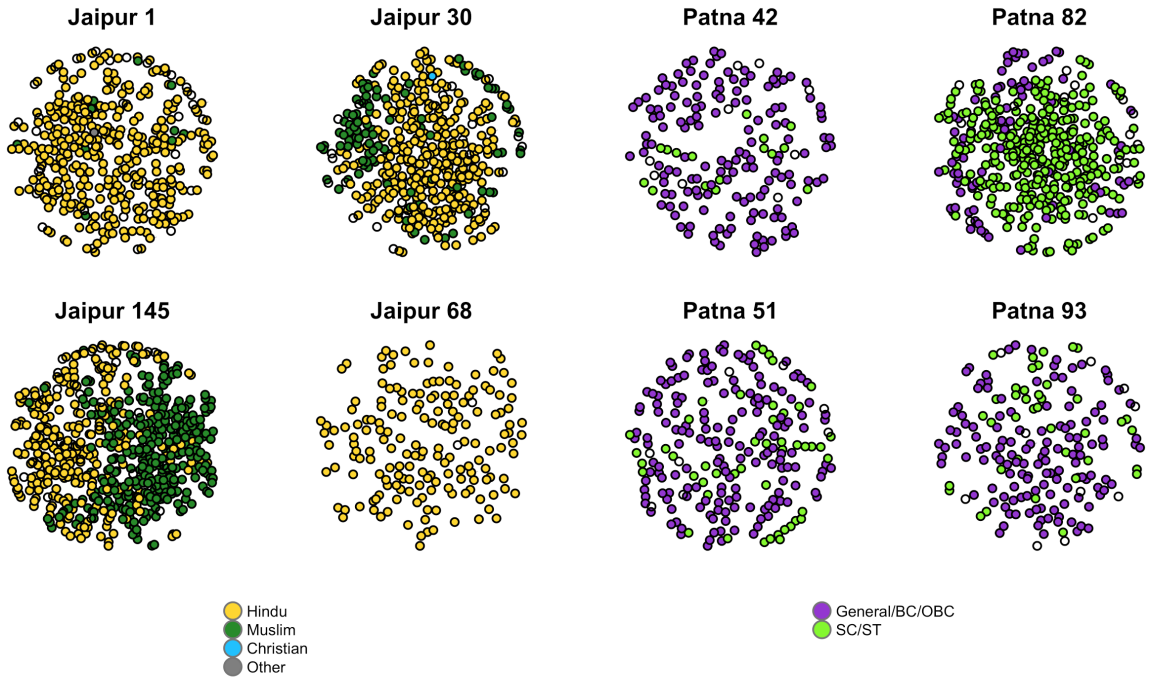
Social Networks in 8 Slums

We distinguish between social networks, economic networks and political networks. Social networks refer to the interpersonal contacts among households. In assessing social networks, we relied on three questions:

- In your free time, whose house do you visit in the neighborhood?
- If you suddenly needed to borrow Rs.1000 for a day, is there someone in this slum whom you could ask?
- Who in the settlement would come to you if they needed to borrow Rs.1000?

The questions on borrowing and lending were classified as social rather than economic, because the small amounts of money involved suggests that this lending is likely to occur among close friends.

Below we present network graphs for each of the eight slums. Each dot in the figure represents a respondent who has named a fellow slum resident as someone that they socialize with as defined by the questions above. The figures are more or less populated with dots in part because the slums vary in their populations. We are less interested in the number of respondents than in the structure of their relationships with each other. Clusters of residents in the figures represent groups of respondents who are naming the same individuals as central to their social interactions.



Consider, first, the graph for Jaipur 145 at the lower left of the figure. It is clear that at least socially, this slum's residents are quite divided along religious lines, with Hindus and Muslims segregated into separate networks; this fact is reflected in this slum having the highest social modularity score in Table 2. On the other hand, Jaipur 30 shows a greater incidence of social ties between residents of different religions (and a lower modularity score). Finally, Jaipur 1 has an even lower modularity score. In this case, the low level of social segregation likely results from the needs of a small Muslim minority to interact with a much larger Hindu majority.

The network graphs for Patna show the same set of social relations, albeit on the basis of caste. In general, segregation along caste lines in Patna is somewhat less stark than it is along religious lines in Jaipur (see the social modularity scores for all eight slums in Table 2). But again, there is considerable variation across slums. Patna 82 and 93, like Jaipur 145, are quite segregated, though in these cases, the social separation is on the basis of caste rather than religion. On the other hand, Patna 51 shows a somewhat greater incidence of social ties between caste groups, which is reflected in a lower modularity score in Table 2.

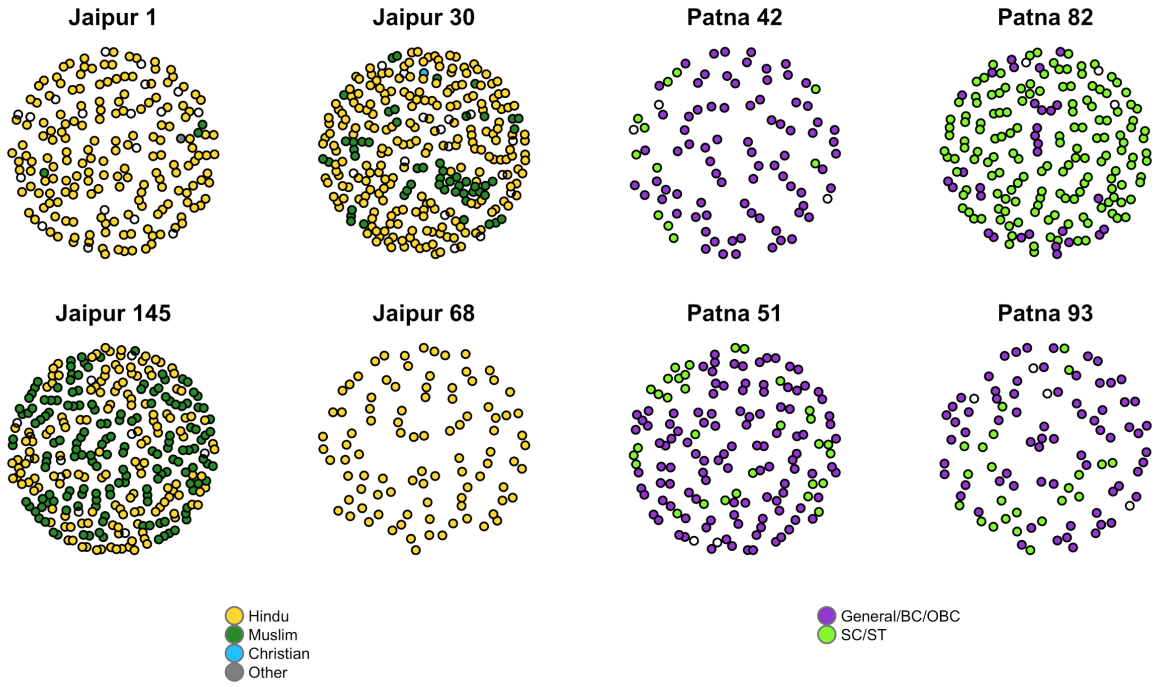
In short, social segregation is not a given, and it varies considerably across slums. These findings point to three directions for future research: First, what are the key social groupings—religion, caste, work, etc.—that promote or militate against social segregation? Second, are residents who socialize with members of other groups—in this case other religions or castes—different than those who do not? It seems plausible that key household characteristics like education, the nature of employment, length of time living in the slum, etc. will impact willingness to socialize across group boundaries. Third, how does the size of minority populations impact the incidence of social ties across groups? One might expect that small

minorities are more likely to socialize together, but the network graphs suggest the answer might be otherwise. Given the ancillary data we gathered on households, we will be able to answer these crucial questions.

Economic Networks in 8 Slums

We define economic networks in terms of the relationships among households bearing on work, unemployment, and housing. The network graphs below are based on the following questions asked of each household:

- When you go to work, do you regularly work with anyone else who lives in this settlement? If so, who?
- Did someone in this settlement help you find your job? If so, who?
- If you unexpectedly were unable to find work, is there someone in the settlement to whom you would turn for help? If so, who?
- Is there someone in the settlement who could help you sell or rent your house?



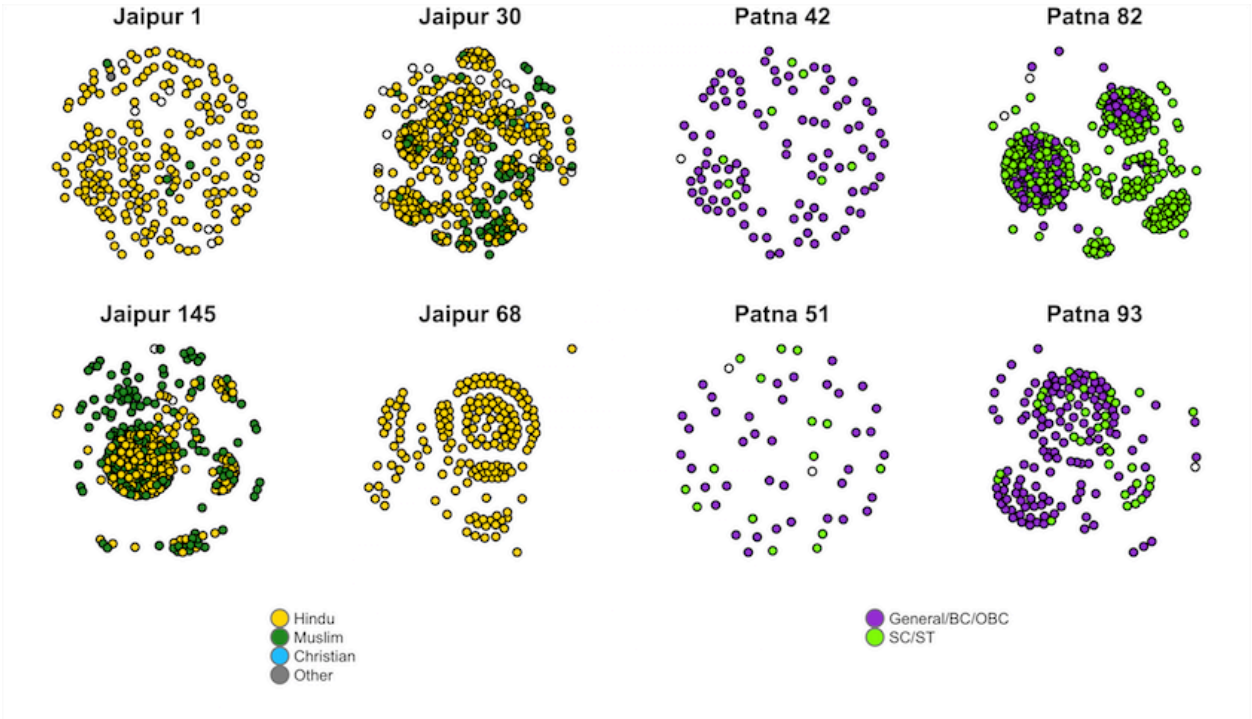
Three findings stand out. First, comparing this set of figures with the ones above on social networks, it is clear that economic networks in these slums are less dense than social networks. This itself is an important finding as it implies that many slum residents' most important economic relationship are *outside* the slum. Second, the slums that are starkly segregated along social lines also tend to be more segregated along economic lines. Note in Table 2 that in general the same slums that score high on social modularity (Jaipur 145 and Jaipur 30 for instance) also show higher scores on economic segregation. Third, however, economic segregation is typically somewhat lower than social segregation (Patna 51 is a noteworthy exception in Table 2).

This finding points to an important area of research, namely: What is the role of social groups, like religion and caste, in shaping relationships across different kinds networks? When taken with the finding below that political networks are even less segregated than economic ones, it seems possible that social differences like caste and religion matter more for social relationships than for political and economic ones that are valuable for their *e*ffect rather than their *a*ffect. In other words, to the extent political and economic relationships are utilitarian, social identities might become less salient.

Political Networks

Finally, we turn to explicitly political networks, i.e. those bearing on local leadership, organization, and voting. Given the importance of municipal politics for access to services, the legal status of settlements, and the potential importance of slum "vote banking", we expect these political networks to have important implications for the wellbeing of slum residents. We construct the political network graphs on the basis of the following questions:

- Is there someone who lives here who might be able to help the neighborhood get that [most needed public] service?
- In the last two years have you participated in a protest like road blocks, picketing or a demonstration? If so, who organized it?
- Who usually leads these [community] meetings [in the neighborhood]?
- Can you give me the name of the first most important leader of your neighborhood?
- Is there anyone whose opinion matters a lot in how you vote?



The political network graphs are striking in the extent to which the nodes in most of the neighborhoods are grouped into clusters, often around a central individual. This is in contrast to the social and economic graphs, in which the organization of the nodes is fairly flat. Moreover,

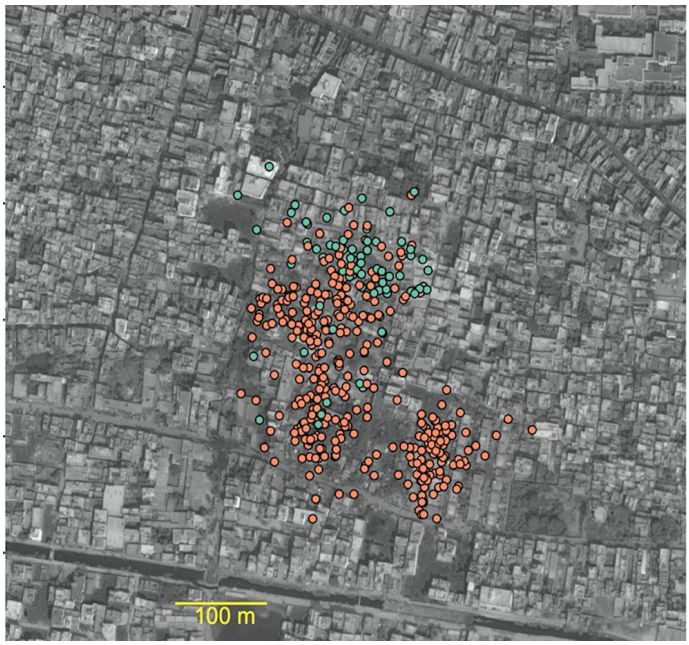
the largest clusters include members of both religion or caste groups, although there may also be smaller peripheral clusters consisting mostly of members of one group. These findings are consistent with the literature on political organization in Indian slums, which finds that political networks tend to be hierarchically organized by central “brokers” who can mobilize the neighborhood’s voters, and whose influence is thought to derive from their ability to connect slumdwellers to government services and thus is not necessarily derived from sectarian or caste linkages.

Again, these initial findings suggest a number of important research frontiers. First, how does the organization of political networks impact the capacity of slum residents to achieve key concessions from city governments? It seems likely that more centralized political networks would be better able to organize protests and vote banking that would draw the attention of politicians and administrators to their needs. If so, the structure of political networks should be correlated with the quality of slum infrastructure and services. Second, how do leaders emerge and what do they do for residents that allows them to remain central to the political organization of slums? Above and beyond complementary questions bearing on these issues in the household survey, we also conducted interviews with the three most-cited leaders in each of these eight slums, plus a broader set of 80 slums in Jaipur and Patna. This offers a unique opportunity to link characteristics of leaders with the underlying social and economic networks in slums. Third and finally, how do differences of household income, religion, work and caste impact on the organization of political networks? Standard accounts suggest that social heterogeneity and economic inequality militate against organization. Our data will allow us to assess these broad claims from the point of view of individual relationships in these eight slums.

Heterogeneity, Segregation and Networks

Finally, we briefly turn to how the explicitly spatial location of households within a settlement might impact how residents interact with each other. Though we know that networks are often shaped by the spatial location of their members, most relational data does not include information on their spatial locations. Thus, we know relatively little about the relationship between network connectivity (which is relational) and spatial connectivity (which is geographic). We were able to gather household locational information, which helps provide insight into how residential segregation by religion, caste, work, etc. impacts relationships among residents. In other words, we can examine how residential/physical segregation within slums bears on segregation in their social, political and economic networks.

The interviews, which typically took place in respondents’ homes, are geocoded to a fairly high degree of precision (<10 m), which allows us to create high-resolution maps of the residential segregation patterns in the neighborhoods. Of the eight slums, five have a substantial number of Muslim as well as Hindu residents; among these five, there is considerable variation in the degree of residential segregation by religion. Mapped below are two slums, one in Jaipur and one in Patna, that illustrate the range of residential segregation.



Jaipur 145

Slum 82 in Patna is clearly segregated by religion, with most of the Muslim households clustered in the extreme northern part of the slum. By contrast, Jaipur 145 is more integrated residentially between Hindus and Muslims. Fascinatingly, the reverse pattern is seen in the social, economic, and political networks of the slums, with the Jaipur slum's networks exhibiting a higher degree of modularity (network segregation) than the slum in Patna. The modularity scores (multiplied by 10 for clarity) for Jaipur 145's social, political, and economic networks are 3.69, 1.53, and 3.28, respectively; the corresponding modularity scores for Patna 82 are 1.82,

0.10, and 1.27.[2] At least in these cases, residential integration does not mechanically correspond to social, economic and political integration.

Much of the existing work on residential segregation assumes that there is a fixed and positive relationship between physical proximity and relational contact. For example, contact theory supposes that physical integration is conducive to racial harmony, because members of different ascriptive groups can interact and form ties with each other. However, the actual empirical relationship between physical and relational proximity has not been extensively studied. In particular, this project has the opportunity to learn whether this relationship varies by the type of network. It might be the case, for example, that social networks tend to occur over smaller geographical scales than economic and political networks. Understanding the nuances of these relationships will help us to understand the implications of residential segregation for such outcomes as intergroup harmony, economic development, and political engagement.

Moreover, the vast majority of work on urban segregation is carried out with the city as the unit of analysis; existing metrics use group compositions at the neighborhood level to calculate a score for the city as a whole. But this approach gives little insight as to how contact with other groups is related to development outcomes and political participation at the level of the individual. This project gives us an opportunity to understand the impact of segregation at a highly disaggregated level.

Understanding the relationship between physical proximity and relational networks is crucial. As rapid urbanization proceeds in India, policymakers are forced to make decisions regarding the construction of settlements for new residents; and these decisions will have tremendous influence on the spatial disposition of urban residents with respect to members of other ascriptive identities. Moreover, efforts to improve slum conditions and urban infrastructure often involve the displacement of residents to new areas. In order to ensure that these policy choices do not disrupt the relational networks that often form the basis of residents' social safety net, access to employment, and political engagement, it is important to understand how these networks vary with physical proximity.

Conclusion

In settings where governments provide limited direct support to poor citizens, those citizens rely on social, political and economic networks as a means to address day-to-day challenges. As such, the interface between social networks and development is an important frontier for policymakers and researchers alike. We have provided some initial insight into the promises of our unique network data on eight slums in Jaipur and Patna. Our data shows very substantial heterogeneity in the density of networks across slums, and it shows that social networks are more segregated than economic and political networks within them. We have also pointed to a series of important pending research questions that we aim to address as we move forward in exploiting this rich, unique relational data.

[2] Note that the modularity values given here are calculated based on religion, whereas those in Table 2 for Patna are calculated based on caste.