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Introduction

What Is This Chapter About?

This chapter introduces the basic concepts of personal network analysis describing what personal networks are, why it is important to study them, and when it is appropriate to use a personal network approach. It also introduces a few basic concepts, such as ego and alter, node and edge, network size, composition, and structure, sociocentric, egocentric, and personal network approaches. Finally, the chapter provides an overview of the book's contents and structure.

1.1 EVERYONE HAS A PERSONAL NETWORK

We all have our own personal network. Who is in that network and how those people are connected to each other say something about us and impact the way we think and behave. From the moment of our birth, a combination of external factors and personal choices determines who will be in our network. Although the popular saying, "You can pick your friends, but you can't pick your family," has some truth to it, we can often choose the level of interaction we have with both friends *and* family. We also choose whether or not to introduce our friends to our family. In other words, we have a lot to say about who is and is not in our personal network, how we interact with them, and how (or even *if*) those people are connected to each other.

We do not, however, have complete control. We do not decide what country, social class, or ethnic group we wish to be born into. These factors affect the environment in which we are initially socialized, as well as the norms that govern social interaction patterns. In addition, we are born into a biological family, which will always constitute the set of biological family relationships from which we can choose. Yet throughout our lives, our decisions about what we do and where we live influence the set of people from whom we choose our contacts, friends, and acquaintances. Those contacts will, in turn,

affect what we do and where we live, constraining the set of people we may potentially meet. The process is complex, with influence in both directions.

The consequences of this lifelong process of interacting with people and with the nonsocial environment, and the interplay between the social and nonsocial world give people different attitudes, behaviors, and outcomes. Personal network analysis attempts to explore the social environment and isolate its effect on people, using the variation from one person to another to explain the variation in what we think the social environment predicts or affects. In other words, personal network analysis is a way of operationalizing social context. Let's consider some examples.

Pam is a secretary in a county Health Department in Valdosta, Georgia, USA. She is 32 years old, married with three children, and was born in a small rural town not far from where she lives now. She went through grade school and middle school in her rural hometown, where most of the students were, like her, black. Her immediate family (father, mother, two sisters, and three brothers) moved to Valdosta around the time Pam entered high school. Valdosta has a small college that draws students from southern Georgia and northern Florida, with its faculty suited to accommodate those students. Pam's high school graduating class was a mix of races, family-income levels, and career tracks for parents. Her coworkers are a similar mix, including a few with whom she went to high school. She works with doctors, nurses, social workers, clerks, and janitors. Pam lives in a neighborhood that is predominantly black and middle class. She attends a Baptist church every Sunday. Her church members and neighbors, including her two sisters and two brothers and their families, make up the core of Pam's friends. Other than her two friends from high school, she does not create situations where people from work associate with her family and friends. Pam likes to keep things separate.

Allen is a software engineer for a company in Rochester, New York. He is 46 years old, white, and recently divorced, with two children who live with their mother. He was born and raised in San Diego, California, but went to college at Cornell University, a family tradition. While in college he joined a fraternity. He met his now ex-wife, a former sorority member, through the fraternity. He has maintained contacts with several fraternity brothers since college. It was through one of his fraternity brothers that he found out about an opening at his company more than 20 years ago. When Allen was married, he and his wife socialized a lot with a few other couples. He didn't have much contact with his brother and sisters at the time. Allen also had a set of friends from his work. The divorce caused some disruption in that set of friends, leaving Allen with a severely attenuated support group. He has recently tried to reconnect with his brother and two sisters, but that has proven difficult as they live in various parts of the country and have not visited each other regularly for many years. His company has laid many people off over the past several years, particularly in Rochester, and Allen's job is on the line. Some of his friends have already lost their jobs, and a few of them have moved away to work in other places.

Helen is a physical therapist in Seattle. She is 28 years old and single. She is an only child. Her father was in the diplomatic service, moving every couple of years until Helen went to high school, at which point they moved to Portland, Oregon. She finished

high school there and then went to college at the University of Oregon in Eugene. She has lived in Seattle for the past four years. Helen is involved in several social groups surrounding her interests. She learned to play the cello as a child and participates in a string quartet that practices at least one night a week and performs at weddings and other formal gatherings. Helen belongs to a biking club that does long rides on Saturday mornings. She also belongs to a gym and conducts a yoga class twice a week. Her job is at a city hospital doing physical therapy with trauma patients. She regularly takes trips back to Portland where she visits her parents. She also maintains contact with a few high school friends, whom she sees when visiting her parents.

These three people clearly have some things in common, but they also differ in many ways. Some of those differences are ascribed (i.e., they cannot be changed): Pam and Helen are women and Allen is a man; Helen is 28, Pam is 32, and Allen is 46; Pam is black, and Helen and Allen are white. Most social scientists recognize the effect that sex, age, and race/ethnicity have on many outcomes, such as physical health, mental well-being, and income. For example, men and women are susceptible to some types of cancers specific to the genetics of their sex, such as breast or prostate cancer. The elderly tend to experience loss of memory and depression at much higher rates than young people. In many parts of the world, women and black people still experience discrimination in many job sectors, which affects their income. These outcomes are related to the unchangeable (or in the case of gender, difficult-to-change) attributes of these people.

Yet other personal attributes *can* be changed. Pam lives in Valdosta, Allen in Rochester, and Helen in Seattle. Pam never moved from the town where her family lives, Allen moved far from his biological family for his job, and while Helen moved, she stayed close enough to visit frequently. How far one moves from his or her family is a life decision that has significant consequences in both the shorter and longer run. On the one hand, being mobile means having more job opportunities. On the other hand, being far away means one cannot rely as much on family for tangible or emotional support. Such support becomes important at different stages of life. For example, the decision to move far from one's parents may cause hardships as those parents age and need their children's help on a regular basis.

Apart from the differences between Pam, Allen, and Helen in their ascribed and achieved personal attributes, we also perceive differences in their social environments. While "social environment" and "social context" are broad expressions that social scientists use to refer to many different things (e.g., the kind of neighborhood in which we reside, the religious and political organizations we belong to, or the type of welfare state we live in), our personal network—the personal community made up of all the close and distant relationships that we maintain—is obviously a major component of what we call the social environment.

The differences in Pam's, Allen's, and Helen's personal networks are in part related to the differences in their personal attributes. On the one hand, our age, sex, race or ethnicity, education, personality, and place of residence determine who we will meet and with whom of those people we will build stronger or longer lasting relationships. On the other hand, our friends and family may also influence our changeable personal attributes. For

example, we may choose to live closer to our parents, quit smoking because our romantic partner doesn't like it, or attend a certain college because our friends go there.

Like personal attributes, personal networks can have a direct or indirect effect on outcome variables such as those we have mentioned: physical and mental health, well-being, occupation, and income. As networks are different, this may play out differently for different persons. Although Allen appears to be in a difficult position, through his work and his college experience he may have established contacts that can lead to other jobs similar to the one he has now. Helen works in a hospital with many doctors and nurses who know other doctors and nurses at other hospitals with knowledge of job openings for physical therapists. What is more, she is involved in groups, such as the yoga class and the string quartet, which might put her in contact with people who are aware of job opportunities. In contrast, in terms of job opportunities, Pam may be more constrained. Like Helen, she knows many people at her work, but the rest of her personal network consists of people who are in a similar position to her own—they have lived in the same place for a long time, many of them know each other, and she has few connections outside her circle of family and friends. With this personal network, Pam is probably not the recipient of a lot of new job information.

At the same time, Pam may receive a lot of emotional and tangible support from her network, another outcome that is in turn related to physical and mental well-being. She can rely on her family and neighbors for child care, rides to the doctor, or shoulders to cry on when things are not going well. Helen may have created a similarly supportive situation in the form of her many social groups and her proximity to her parents, even though her relations have a shorter duration, while Allen's network offers him little support in the "well-being" area at this stage of life.

1.2 THE SIZE, COMPOSITION, AND STRUCTURE OF PERSONAL NETWORKS

So far, the effects of personal networks that we have discussed are primarily concerned with the types of people in the network—that is, what the network is *composed* of. When we talk about network *composition*, we refer to the characteristics or attributes of the network members, or network "actors." Pam, for example, has a network composed of family members, friends from high school, neighbors, church members, and colleagues. These are all different roles played by Pam's network members. Helen's network also has high *role diversity*, although it has fewer family members than Pam's. Most of Pam's contacts live in the same town as she does, many even in the same neighborhood, so her network can be said to be mostly *local*. Helen's contacts, in contrast, are geographically more dispersed than Pam's network members. We also saw that Pam's colleagues are quite mixed in terms of social class and race, whereas Pam's other relations are more similar to hers.

Apart from differences in network composition, personal networks can also differ in *size*—that is, the number of people in the network—and in the way those people have

relationships among themselves—that is, the *structure* of the network. Two personal networks with roughly the same composition in terms of the characteristics of actors can have very different effects on the person when their structures differ. We have alluded to these effects with Pam. The fact that most of Pam's family, friends, and neighbors all know each other means that they may tend to recycle the same sort of information. They may also talk openly to each other about Pam and her life, something that helps her in some circumstances but hinders her in others. Because Pam's network members communicate about her, Pam's children may be safer walking around the neighborhood, or she might readily get help with physical health problems were they to arise. However, if Pam became depressed, a condition still associated with social stigma in U.S. society, she might be reluctant to tell anyone in her network, or she might ask a friend for suggestions on how to seek treatment, since her contacts all know each other and could share information about her. She might worry that her entire personal network could be talking negatively about her at some point. Given the structural characteristics of her personal network, Pam's fear of being looked down on by her family and friends might actually serve to isolate her from her social network. In other words, the fact that many members of Pam's network know each other may increase her possibility of mobilizing social support when needed, but it also increases social control and pressure compared to others (like Allen and Helen) whose networks are less connected.

Finally, compositional and structural characteristics can be combined to gain an entirely new insight into the effects of personal networks. For example, Helen belongs to several groups: the hospital where she works, the string quartet, her yoga class, the biking club, and her family at home in Portland. Helen has a best friend, Wendy, whom she has known since high school and who, like Helen, moved to Seattle. Wendy has attended several of Helen's performances, has met her friends from work, and takes her yoga classes. Helen also knows Wendy's family. Wendy is in a structurally important position in Helen's network because she knows many of Helen's contacts and bridges several of Helen's groups. Wendy also has the characteristic of being Helen's friend from high school and main *confidante*. Helen tells her everything. Wendy's *central* position in the network, combined with her role as a high school friend and her function as Helen's primary support, can benefit Helen, as she can easily talk with Wendy about her life and the people in it. However, a falling-out between the two friends could be devastating to Helen, not only because of her relationship with Wendy, but also because Wendy is part of many of her social circles.

These examples show us that the people we know and the way they are connected to each other can affect our attitudes, behaviors, and outcomes. However, we are not passive participants in the composition and structure of these relationships. We make choices about who will be in our networks, who we will connect to one another, and how closely we will connect them. In part depending on our personality, some of us are more passive observers of what goes on in our network, while others carefully strategize and shape the composition and structure of their personal network. So, we are active agents in the construction of our networks, and at the same time, we are constrained by them. This complexity makes it challenging to study personal networks.

1.3 EGOS, ALTERS, EGOCENTRIC NETWORKS, AND SOCIOCENTRIC NETWORKS

Personal network research falls under a larger field of study called *social network analysis*—and, more recently, *network science*. Broadly speaking, social network analysis is the study of the pattern of relationships between social actors. While the term "social network" instantly evokes Facebook, Twitter, and the like, in the social sciences a social network is simply any set of actors (or *nodes*) and the ties among them (or *edges*, i.e., the lines connecting the nodes). These exist not only online but also offline. The network actors are usually people, but they need not be. Social network studies have been done on the collaborative relationships between organizations (Van de Bunt & Groenewegen, 2007), the migration flows between countries (e.g., Danchev & Porter, 2018), and even the affiliation patterns between animals (e.g., Mann, Stanton, Patterson, Bienenstock, & Singh, 2012). Actually, any set of relationships between organisms or groups of organisms can be analyzed using social network analysis.

Historically, social network analysis has comprised two broad approaches. The first is *egocentric network analysis,* which studies the social networks surrounding selected people. These focal persons, whose networks we are interested in, are called *egos*, and their network members are called *alters*. In the preceding examples, Pam, Allen, and Helen are the egos, and their family, friends, and acquaintances are the alters. Thus, an egocentric network is a social network among the contacts (alters) linked to a focal person (ego).

Egocentric network analysis can either be constrained to the social relationships that people have in a particular context, such as their workplace or school; or it can be unconstrained, in which case it is also called *personal* network analysis. Personal networks are thus egocentric networks across multiple social contexts or settings. We may be interested in the specific *egocentric* network of Pam's coworkers, or we may be interested in Pam's total *personal* network, including her family, friends, coworkers, and any other contact with whom she interacts. With personal networks, our goal is to study the effects of the set of relationships that surround an individual, regardless of the context from which they are drawn. Therefore, we usually need to ask respondents to tell us which people are in their networks, as they may be anyone.

Sociocentric or *whole networks* are quite different. Instead of focusing on the people who surround a particular person or set of persons and the effects these people have on that person or persons, whole network analysis studies the pattern of relationships between actors in a defined, bounded group or a community or a context. A good example is the network of relationships between students in a school. In fact, some of the earliest known whole network analyses were conducted in elementary school classrooms to understand how the interactions among students affected their performance (Heidler, Gamper, Herz, & Esser, 2014; Moreno, 1934). The network of romantic relationships among students in a college is a sociocentric network; so are the network of friendship relationships among residents in a village and the network of email communications among coworkers in a company.

An important difference between egocentric and sociocentric network analysis has to do with how we collect the data used in our study. With egocentric networks, we only observe (e.g., interview) the egos. While the alters are part of the ego's network, they are not directly observed. By contrast, with sociocentric networks we observe (collect data from) all network actors. Also keep in mind that with egocentric network analysis we deal with many separate networks, as we typically observe a sample of egos. For each of them, the network includes the ego, the ego's alters, and the relationships among the ego's alters. Usually, though, we are not interested in the relationships between the different egos or between the alters linked to different egos. By contrast, in sociocentric analysis we may deal with a smaller number of networks, or even a single network, in which all the actors may be directly or indirectly connected to each other.

1.4 SHOULD I USE PERSONAL NETWORK OR WHOLE NETWORK ANALYSIS?

The decision of whether to study personal or whole networks depends on the research questions and hypotheses you have, as well as the type of data collection that is feasible in your case. Suppose you are interested in adolescent smoking behavior. You believe that whether an adolescent *A* will experiment with cigarette smoking depends on the social influence exerted on *A*, that is, on the attitudes, views, and behavior of the members of *A*'s social network. You would like to use social network data and methods to test this hypothesis.

In one approach, you hypothesize that adolescents' smoking behavior depends largely on the actor attributes and pattern of relationships in their high school network: in other words, whether *A* will start smoking depends on *A*'s position in her school's social network—a whole network—and on the attitudes and views of *A*'s school mates. If this were your hypothesis, you would focus on a specific high school, and collect and analyze data about the whole network that exists among adolescents within that high school. This would be a *whole network approach*: you identify a group (the high school), and you look at the whole, bounded social network that exists within that group. This approach also allows you to look at broader, group-level processes, such as what cliques, subgroups, or factions form in the school network and why; whether the school has a core of very central actors (actors who are related to many others) and a periphery of more marginal ones; what "classes" of actors have structurally similar positions in the school network and why; and how ideas and behaviors spread among individuals or groups to the larger school network.

In a different approach, you could determine that while you are sure that an adolescent's network influences her decision to start smoking, you don't really know whether only the adolescent's school mates, or also her neighborhood friends and family members, play a role in this process. In other words, you know that *A*'s social network matters, but you don't know where to set the boundaries of the social network that is relevant to your outcome of interest. In this case, you would focus on *A* herself and on

other similar adolescents (the egos), and you would collect and analyze data about the unbounded personal networks surrounding these adolescents, separately from each other. This would be a *personal network approach*: you identify the focal individuals (the adolescents), and you look at the unbounded social network that exists around each of them. This strategy gives you a deeper lens on the social environment around each adolescent. However, this comes at the expense of the ability to capture broader processes within a larger group such as the whole high school. Plate 1.1 illustrates this important difference between a whole and a personal network approach.

To make the difference clearer, let's consider some simple network data and visualizations. Whole network data can be collected in many ways, but one approach is to ask each member of the bounded group to evaluate their relationship with every other member. Let's consider a classroom of students. Table 1.1 depicts an *adjacency matrix* collected on the first day of a graduate class in social network methods. Each of the 12 students was asked to rate on a scale of 0 to 5 how well they knew every other student. The answers of each person were then recorded in a row in the adjacency matrix. For example, the first row represents the answers of Irene on how well she knows each of the 12 students. The diagonal running from the upper left to the lower right has all 5's, since each person knows him- or herself as much as possible. Sometimes these cells are also left empty, since researchers are usually not interested in relations to self. Notice also that this matrix is *asymmetric*, meaning that the two people need not agree on the level of their relationship. For example, Irene said she knows Christie at level 2 (the second number in the first row is a 2), but Christie said she knows Irene at level 1 (the first number in the second row is 1).

TABLE 1.1. Adjacency Matrix of a Graduate Social Network Class

	Irene	Christie	Ruby	Tom	Darlene	Sally	Flora	Erma	Melissa	Kent	Mable	Andre
Irene	5	2	2	0	0	1	0	3	1	0	2	0
Christie	1	5	5	0	0	0	0	1	0	0	2	0
Ruby	2	5	5	0	0	1	0	2	0	0	4	0
Tom	0	1	1	5	0	0	0	0	0	0	0	0
Darlene	0	0	0	0	5	0	0	0	0	0	0	0
Sally	2	0	2	0	0	5	5	2	0	0	2	0
Flora	0	0	1	0	0	5	5	5	0	0	2	0
Erma	4	3	1	0	0	1	5	5	0	0	3	0
Melissa	1	0	0	1	0	0	0	0	5	0	1	0
Kent	0	0	0	0	0	0	0	0	0	5	0	3
Mable	2	3	3	0	0	1	2	2	1	0	5	0
Andre	0	0	0	0	0	0	0	0	0	3	0	5

One way social network researchers analyze these data is by visualizing them. That is, we can create a drawing that shows us the network resulting from these numbers. Figure 1.1 is a network visualization of the data in Table 1.1, where the 12 nodes represent the 12 students and the arrows from one node to another represent the existence of a relationship from one student to another (at a level of 1 or higher, in this case). The wider the arrow, the stronger the relationship. For the sake of visual clarity, in the case of two people who agree that they know each other, but don't agree on the strength of that relationship, as was the case of Irene and Christie, the width represents the strongest relationship of the two. Self-relations have been excluded from this graph.

The figure is quite informative. For example, it shows that, on the one hand, Tom indicated that he knows Christie and Ruby a little bit, but the women didn't indicate they knew Tom. On the other hand, both women indicated that they know each other very well. This information is not so easily extracted from the adjacency matrix.

We can see from this visualization that a large group of people are connected in the class. These were all students in the Anthropology Department. Andre and Kent at the top, were from the management department, and Darlene in the upper right, an *isolate*, was a political science student. This visualization gives us a quick understanding of how the people within this group relate to each other.

Whole networks represent social groups that most people would agree *are* a group. For example, researchers have performed whole network analyses of the people in an office and in a karate club (Zachary, 1977), and even an archival study of the whole network of the Italian aristocracy in Renaissance Florence (Padgett & Ansell, 1993). A crucial point in whole network analysis is that the group has well-defined boundaries, and we are only interested in relations or interactions that occur within those boundaries. We know who is in the group and who is not, and the group has some reason to interact, such

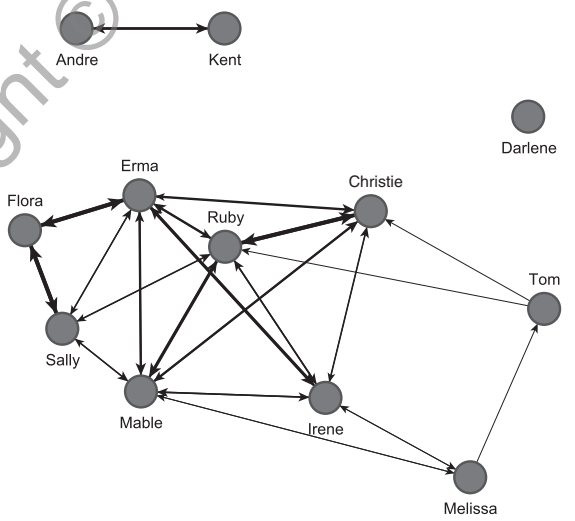

FIGURE 1.1. Network visualization of the adjacency matrix in Table 1.1.

as working together, playing together, or living near each other. We assume that only the relations or interactions that take place within the bounded group are relevant to the outcomes of interest, and we study the structural patterns that emerge from those relations.

In contrast, personal network analysis is about the *un*bounded networks surrounding individuals. This is an important conceptual distinction. In the preceding example, the whole network analysis of the graduate class informs us about what we can expect to happen when the students interact. For example, we would expect Andre and Kent to collaborate on a class project, and we might expect all the anthropologists to talk to each other about how to incorporate the methods into their dissertations. The conclusions we draw are limited to how these students interact within the context of their group, a graduate class in social networks.

While valuable for certain information, whole network analysis will not help us predict much about Andre or Kent as individuals outside of their class. For this we need personal network analysis because it accounts for influences from the many groups to which a person belongs. While both Andre and Kent belong to this graduate class, it is unlikely that this is the only group that influences them. Kent's family, his other professors, friends, and members of other social groups may all contribute to forming his attitudes and conditioning his behaviors. And while no two personal networks are exactly the same, similarities in personal networks affect people in similar ways.

Plate 1.2 shows Kent's personal network with 45 personal contacts (blue nodes are men and red nodes are women). The visualization is obtained from an egocentric adjacency matrix, a subset of which is in Table 1.2. This is very similar to the sociocen-

TABLE 1.2. The First 12 Rows and Columns of a Personal Network's Adjacency Matrix

	Sheila	Kelly	Ivan	Amos	Rose	Alex	Bertha	Henry	Susie	Van	Jack	Erika
Sheila	1	1	1	0	1	1	1	1	1	1	1	1
Kelly	1	1	0	0	1	1	1	1	1	1	1	1
Ivan	1	0	1	0	0	0	0	0	0	0	0	0
Amos	0	0	0	1	0	0	0	0	0	0	0	0
Rose	1	1	0	0	1	1	1	1	1	1	1	1
Alex	1	1	0	0	1	1	1	1	1	1	1	1
Bertha	1	1	0	0	1	1	1	1	1	1	1	1
Henry	1	1	0	0	1	1	1	1	1	1	1	1
Susie	1	1	0	0	1	1	1	1	1	1	1	1
Van	1	1	0	0	1	1	1	1	1	1	1	1
Jack	1	1	0	0	1	1	1	1	1	1	1	1
Erika	1	1	0	0	1	1	1	1	1	1	1	1

Note. The full adjacency matrix has 40 rows and columns and corresponds to the personal network in Plate 1.2.

tric adjacency matrix in Table 1.1, except that rows and columns are Kent's personal contacts, and each cell is 1 if Kent says that the two contacts in the cell's row and column know each other, 0 otherwise. Kent's personal network has a typical structure that consists of different cohesive subgroups, corresponding to the social circles that Kent interacts with. The dense group of nodes in the top left of Plate 1.2 is Kent's extended family. Kent has a large family in which, as we would expect, most relatives know each other; this results in a large, dense cohesive subgroup in Kent's personal network. The few blue nodes in the top right of the figure are Kent's old friends from high school. Some of them know Kent's family, while others don't. In the bottom left is the group of Kent's new friends in graduate school. They mostly don't know Kent's family, but some of them know Kent's old friends in the top right. In the middle is Kent, the ego, exposed to interactions with and influences from each of the social groups that form his personal network. Understanding these influences and their effects on people like Kent is the reason for studying personal networks.

One way of thinking about personal networks and whole networks is as different "slices" of, or windows on, social reality (Plate 1.3). Each of these windows has its pros and cons for understanding the social world—each of them shows something but hides something else. Personal networks offer an in-depth view on the social world of the individuals of interest (the egos), including contacts from any possible context, circle, and social setting. However, they are limited to the egos' direct contacts—what network analysts would call the *first-order neighborhood* of egos. Also, personal networks typically do not include information about connections among different egos or alters of different egos. In fact, if we sample individuals randomly from a larger population, we normally expect there to be no connection between different personal networks. By contrast, whole networks show us how the individuals of interest (the network actors) are embedded in a larger social structure, which includes the indirect contacts that are removed from an actor by several links or *degrees of separation*—in other words, the first-order and the higher-order neighborhoods of our individuals of interest. These individuals can be connected and share common contacts, unlike egos in personal network data. However, whole networks are limited to a single social setting, which in our example is the high school, and give us no information about the broader personal community of which each individual is part, beyond the selected setting.

In general, a whole network approach is more appropriate for your study if you can confidently assume that a single social setting, group, or organization (e.g., the high school) is what matters most for your outcome of interest (e.g., academic performance); or if you would like to capture the way in which individuals are embedded in the whole social structure of this group, including first-order and higher-order neighborhoods. You should also opt for whole networks if you are interested in group-level processes and outcomes: for example, looking at the whole networks of different high schools, how the cohesion of the school network is associated with the average performance of the school sport teams.

By contrast, you should choose a personal network approach if you are interested in a population of individuals, and the outcomes of these individuals (such as mental well-being, physical health, or occupational attainment) are likely affected by the broader

Combining Personal and Whole Networks

Caterina Gouvis Roman and colleagues (2012) studied delinquency and gang membership among the youth in a small, disadvantaged, high-crime neighborhood in Maryland. They interviewed 147 young people between the ages of 14 and 21 in the neighborhood, for which they estimated the total number of youths to be 440. The researchers asked them to list 20 people they "hang out with or might see regularly in a typical day," about the characteristics of these alters (e.g., age, sex, place of residence, type of relation, perceived gang membership, and gang-related activities the ego knew about), and the relationships among the alters. After data collection, the researchers superimposed the personal networks of the respondents to create a whole, or sociocentric, network of the youth in the neighborhood and their relationships. Thus, they conducted both personal *and* sociocentric network analyses. Results showed that respondents with more numerous groups of relationships were less likely to be involved with delinquency. Also, those who were more central in the network of the neighborhood appeared to have a higher level of delinquency, but not of violence, than those less central.

social world or personal community in which they are embedded, including different circles and settings. Also, you should opt for personal networks if capturing each individual's entire personal community (but limited to direct contacts) is more important than knowing where each individual is located in the wider, first-order *and* higher-order social structure (but limited to a selected group).

Last, you can combine personal and sociocentric analysis if you are interested in the individuals in a bounded social group, such as a neighborhood, a school, or a prison, but you think that they are influenced by both the people in the group and the broader environment.

1.5 WHO IS THIS BOOK FOR?

This book focuses on research into personal networks. Personal network analysis is a way of operationalizing an important part of the social context: the immediate interpersonal environment. Anybody who is interested in describing that part of the social context of individuals, or who wants to predict an individual attitude, behavior, condition, or outcome they believe is in part due to differences in interpersonal environments may benefit from personal network analysis. In fact, personal networks are a particularly rich way of operationalizing the interpersonal context; they allow us to measure both the characteristics of the people who form an individual's social context (network composition) and the social structure that these actors create around the individual by interacting with each other (network structure). Personal network analysis helps us go beyond an individual analysis to incorporate contextual effects as explanatory variables for individual outcomes.

Figure 1.2 shows how personal network analysis can enhance a research design. On the left is the traditional model where respondent characteristics, such as age, sex, race/ethnicity, and income are used to predict some outcome of interest, such as physical or mental health, job attainment, or discriminatory experiences. On the right is the personal network model. The explanatory variables in this model include respondent characteristics but add to it characteristics of the personal network, such as the size, composition (e.g., the percent of alters the respondent can talk to about health issues), or structure (e.g., the cohesiveness of the network). These variables reflect characteristics of the respondents' social contexts, adding to the explanatory value of the model. Of course, prior knowledge of the field of study and theories can help us design different models. We may, for example, expect that personal network characteristics do not have a direct effect on the outcome, but rather that they alter or mediate the effect a respondent characteristic has on the outcome. For example, we may expect that introverted people (respondent characteristic) are more likely to get depressed (outcome) than extroverted people, but that a densely knit, supportive personal network (personal network characteristic) can form a buffer particularly for introverts, thus lowering the probability that introverts will become depressed. The precise mechanisms through which personal networks are thought to have an effect can differ from one model to another, but all personal network models have in common the use of personal network characteristics as explanatory social context measures in addition to respondent attributes.

Personal network analysis also allows us to understand the social organization of informal ties itself, at both a micro and macro level. Social cohesion in a population, for example, defined as the degree to which different subgroups in the population are connected by informal social relationships, can be studied by analyzing "*homophily*" (the tendency to associate with similar peers) in personal networks for a sample of individuals from the population (see Section 2.2).

As you will see, collecting personal network data can be time consuming and expensive. Therefore, the personal network approach should not be used when the variables you are trying to measure can be observed by asking more easily measured and

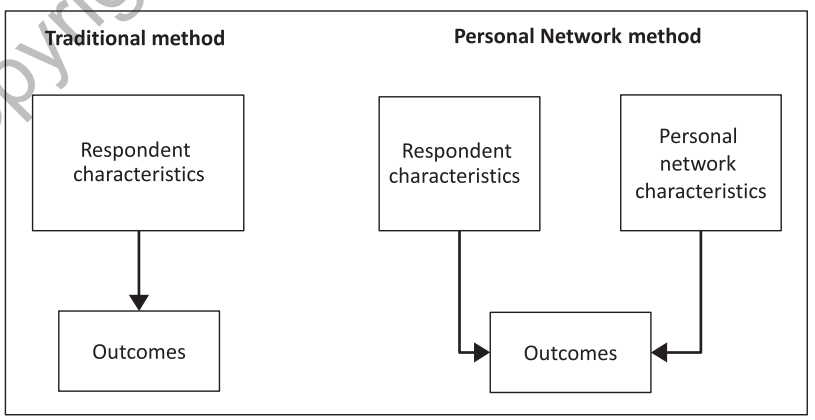

FIGURE 1.2. Models of social science research designs.

less intrusive proxy questions. In other words, if you can develop a model to predict smoking by simply asking respondents if their friends smoke, rather than collecting a lot of details about which friends smoke and how these friends interact with each other, you should not use the techniques described in this book. However, if you intend to study the interpersonal environment of the respondents, or a phenomenon dependent on that part of social context, and you think that a higher level of detail can provide important insight, personal network analysis offers a unique perspective that is often ideal for such studies.

This book is primarily aimed at readers who have no previous knowledge of personal networks or social network analysis. Most of the book should be easily understandable to students who are approaching social networks for the first time. It can be used on its own or as a companion to a book on the broader field of social network analysis, which would be typically more focused on sociocentric networks. Two such books are *Doing Social Network Research: Network Based Research Design for Social Scientists* by Garry Robins (2016) and *Analyzing Social Networks* by Stephen Borgatti, Martin Everett, and Jeffrey Johnson (2013). This book focuses primarily on personal network data collected through interviews and surveys, and we devote less attention to data extracted from online networking websites and applications, because we believe that in most cases online data are not a good substitute for data on offline social interactions. However, online data are valuable for understanding computer-mediated communication and can be used in tandem with personal network data (see Sections 3.4 and 6.7). Readers with an interest in mining online social networks are referred to *The Sage Handbook of Social Media Research Methods*, edited by Luke Sloan and Anabel Quan-Haase (2017). Matthew Salganik's *Bit by Bit: Social Research in the Digital Age* (2017) provides an excellent overview of the potential benefits and pitfalls of such data for the social sciences.

1.6 BOOK OVERVIEW

This book will guide the readers through the various stages of personal network research, extending from design and data collection to visualization and analysis. Chapter 2 gives a brief historical overview and presents the theoretical frameworks that have driven personal network research. Knowledge of these frameworks is important for developing a research question for a personal network project, which we discuss in Chapter 3. The research question will largely determine how you design your study.

Chapters 4 to 10 describe the design of personal network research. We focus primarily on a quantitative approach because the delineation of networks and even their structured visualization imply quantitative measurement. Nevertheless, we have often successfully used these methods in mixed-methods research, and we will often refer to it. Chapter 4 gets you started on the basics of surveys, particularly as applied to personal network research, and Chapter 5 presents questions you could ask about the respondents. As we explain in Chapter 4, personal network research is in part similar to any other survey or interview-based research, and therefore we review their basics in

these two chapters. If you have experience in survey research, you may skip Chapters 4 and 5. Chapters 6–8 describe how to measure personal networks following the three steps most personal network researchers take: (1) To delineate the network using name generators or alternative approaches, (2) to ask questions about each network contact in order to measure network composition, and (3) to ask questions about the relationships between network contacts in order to measure network structure. The collection of these data allows researchers to visualize the networks, visualizations which they sometimes use during the interviews to collect more information. This is why we discuss visualization in Chapter 9. Chapter 10 reviews quantitative methods used to collect data about the characteristics of personal networks that do not involve the generation of a set of names. Usually, these methods focus on the larger personal networks (see Section 2.2).

After the discussion of the design of personal network research, we focus on analysis in Chapters 11 to 13. Chapter 11 discusses how you can summarize the relation-level data in aggregate or summary variables that describe network composition and network structure. Chapters 12 and 13 present more advanced topics in network measurement and statistical modeling, which require some previous familiarity with quantitative methods for the social sciences, mostly regression analysis. If you don't want to get into much detail, you may omit these two chapters and read Chapter 11 only.

The final chapter discusses research ethics. Of course, researchers need to take ethics into account during the whole research cycle, but we first want to give the reader a proper introduction to personal network analysis before delving into the sometimes tricky world of ethics. We encourage all readers to consult this chapter at the initial stages of research design and to keep its points in mind in later stages.

At the end of each chapter are suggestions for further reading that cover background concepts or more advanced treatment of the chapter's topics. The appendix, at the end of the book, lists software that has been specifically designed for personal network research. This list also includes software that is not specifically designed for it but is useful nonetheless.

CHAPTER SUMMARY

This chapter presented the personal network as the network of social relationships surrounding an individual, where relationships can stem from different social settings. It further introduced some basic concepts and terminology: for example, "egos" and "alters"; the difference between personal, egocentric, and sociocentric network approaches; and the appropriate time to use them. Three cases (Pam, Allen, and Helen) illustrated some of the factors that affect the size, composition, and structure of personal networks, as well as the role of individual agency, social constraints, and the course of life within them. Although collecting data from personal networks can be a difficult task, it provides privileged insight into the immediate social environment of individuals and has proven useful in explaining many research problems. We will discuss this use in the next chapter.