Summer 1-1-2012

Exploring Support Network Structure, Content, and Stability as Youth Transition from Foster Care

Jennifer E. Blakeslee
Portland State University

Exploring Support Network Structure, Content, and Stability as Youth Transition from Foster Care

by

Jennifer Elizabeth Blakeslee

A dissertation submitted in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy
in
Social Work and Social Research

Dissertation Committee:
Thomas Keller, Chair
Katharine Cahn
Nancy Koroloff
Bowen McBeath
Peter Collier

Portland State University

ABSTRACT

Many older youth in foster care lack adequate resources and ongoing support in their social networks as they transition into young adulthood, while other youth in these circumstances experience stable social networks providing comprehensive support. Systematically measuring the supportive personal and service-oriented relationships in youth networks expands the scope of inquiry in this area by identifying patterns of social network structure, member composition, and relational qualities that are associated with more or less support provision through formal and informal relationships. These can also be measured over time to observe changes in network form and content and assess network stability. This exploratory study (1) describes the support networks for a small sample of youth with foster care experience who are enrolled in post-secondary education and training programs, (2) assesses changes in these networks over time, and (3) demonstrates the reliability and validity of this methodology for broader use with populations of transition-age foster youth. Findings show that family (biological and foster) and friends are the most prevalent informal supports, relationship ties to parent figures are strongest and provide the most stable and multi-dimensional support, and ties with formal service providers are not as strong, but provide more informational support. The stability of a network ties over time is associated with the breadth of support provided, and network-based social support is associated with post-secondary enrollment at follow-up. Support network profiles are described and interpreted in terms of bonding and bridging social capital. Discussion includes implications for future support network research and guidelines for pre-transition assessment of youth networks in practice.

ACKNOWLEDGMENTS

First, I'd like to thank the committee members. Thank you to Bowen McBeath, who I credit with sparking my scholarly aspirations through challenging work, high expectations, and thoughtful engagement. I simply would never have dreamed of pursuing a Ph.D. without your feedback and encouragement, and it was the best decision I ever made. Thank you to Katharine Cahn for similarly encouraging my interest in child welfare research, connecting me to rewarding projects, and recognizing my strengths; your practice-oriented perspective and "fast-twitch brain" are an inspiration. Next, thank you to Nancy Koroloff; I'd been advised by friends, quite accurately, that's you would be an excellent sounding board and a supportive mentor, and I'm honored that you readily agreed to serve on the committee based only on my elevator pitch. And thank you to Pete Collier; I'm sure I'm not the first to appreciate your perspective and humor and willingness to support a student through the home stretch, and I'm grateful you agreed to sign on for this.

Next, I'd like to express my endless gratitude to Tom Keller, if I can find the words. So much of this dissertation has grown from seeds planted in our very first meeting, and our ongoing conversation has been my intellectual and motivational touchstone for over four years. You have been tirelessly supportive, generous with your time and thought, and enthusiastic about my enthusiasms, and you have always understood and encouraged my dogged determination to stay focused on the research agenda reflected here. Your opinion is invaluable to me and earning your respect as a

writer, thinker, and researcher has been incredibly rewarding. I could not have done this without your support and I'm deeply thankful to have had you as a mentor.

Lastly, I want to thank my wonderful family and friends, who did not always understand what I was up to, but supported me wholeheartedly nonetheless. To Laury Mead especially, you have given me more love and sustenance and tangible and intangible support than could ever be accurately measured for a dissertation. It may be easiest to simply say that from the bottom of my heart, I wish that every youth in foster care who needs an Aunt Laury had their very own, because I believe that it would make all the difference. To David and Susan Blakeslee, Andrew and Brandy Blakeslee, and Laurie, Kip, and Paige Clark, thank you for always being there when I needed to take a break from school and relax with my family. To all of my old and new friends, but especially to a particular pocket of friends who know exactly who they are, thank you for everything else the last few years. Lastly, this dissertation is dedicated to my loving mom, Karen Mead Blakeslee, because I know she would have been so proud.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: Introduction

In most cases of foster care placement as a child welfare intervention, children and youth are only temporarily removed from their homes of origin and families are successfully reunified. When families cannot be reunified due to safety or well-being concerns, the policy and practice goal is to achieve permanency through adoption or guardianship by relatives or non-relatives who can provide long-term family-based support. Approximately 20% of the youth in foster care in the United States are 16 or older (USDHHS, 2009), and in many cases, these older youth will be adopted or placed permanently with kin before age 18. However, in the United States, 10% of the children and adolescents who enter foster care will eventually "age out" of the child welfare system without achieving stable guardianship through family reunification, adoption, or other permanent arrangement (USDHHS, 2009). This specific subpopulation is more likely to exit foster care without adequate resources and long-term support, and ultimately, to experience relatively poor outcomes in young adulthood (Courtney, Dworsky, Ruth, Keller, Havlicek, & Bost, 2005; Pecora, et al. 2006). Given evidence of similar at-risk subgroups in other Western societies, the difficult transition of some older youth from public child welfare systems is recognized as a phenomenon of international relevance (Mendes & Moslehuddin, 2006; Munro, Stein, & Ward, 2005; Pinkerton, 2006; Stein & Munro 2008).

Although older youth transitioning from the child welfare system are a specific subpopulation with elevated risk for poor outcomes, there is wide variation in individual and circumstantial factors—for example, foster placement stability, or ongoing

supportive relationships with kin—that likely influence transition experiences, whether youth are placed permanently as older adolescents or ultimately transition directly from the foster care system. Accordingly, there is a need for research identifying common contributors to relatively successful or unsuccessful outcomes when older youth with recent foster care experience transition from child welfare systems in varied social environments.

For youth exiting foster care as older adolescents, the social environment provides differing degrees of formal services and informal support, which may influence how individual youth factors translate to transition outcomes. Ideally, child welfare intervention strengthens support through a combination of formal family-based services and the development or continuation of existing informal support from kin and others in a way that ultimately improves youth well-being and long-term outcomes. Although the goal of out-of-home placement is to build youth networks providing comprehensive support and resources, the social networks of some older youth in foster care have likely been compromised by aspects of child welfare involvement—including disrupted family relationships and long-term foster placement—in ways that inhibit the support and resources available during the transition from care. For example, research has identified large subgroups (e.g., 43% in Keller, Cusick, & Courtney, 2007) of transition-age youth experiencing a combination of placement instability, relatively low social support and service engagement, and few attachments to supportive adults (Keller, et al., 2007; Stein, 2006a), all of which describe potential constraints on the formal and informal support and resources available to these youth through their social network. Because these network-

based factors may contribute to outcomes, there is reason to specifically assess network-based support as older youth exit foster care, which may help determine what kinds of support network characteristics predict successful transitions from the child welfare system.

Social network analysis is an innovative approach for understanding the context of support provision for these transition-age foster youth. By systematically measuring the interconnected relationships in youth support networks, social network analysis provides a way to capture structural, compositional, and relational associations with both personal and service-oriented support provision. These network characteristics may reflect variation in the availability of support by type and source in these networks, and may reveal network processes that could facilitate or hinder successful youth transitions to independence. To begin to explore youth transition experiences from a social network perspective, patterns of support provision can be described using network methods that quantify social structure by systematically measuring the people and relationships in identified networks. Basic structural properties include network size and density, or the degree of interconnection between members, as well as network composition in terms of member attributes or social roles. The nature of each relationship is also important—for example, ties can be measured in terms of frequency, closeness, and duration. These network aspects are used to help describe the flow of social processes—here, the provision of support—in networked relationships. These descriptive properties can then be compared by groups and over time to explore network patterns of structure, content,

and stability, that may ultimately influence individual outcomes, based on established social network theory (Marin & Wellman, 2010).

This study uses social network and social support data from a mentoring intervention designed to support youth with foster care experience as they transition into post-secondary education. The purpose of this study is to: (1) describe the personal support networks in this sample, and associate these network-level variables with individual-level predictors and patterns of support provision, (2) assess changes in youth network form, content, and membership over time, and (3) and evaluate the reliability and validity of the network instrument used with this population. More broadly, this is a preliminary practical application of the social network research perspective to inductively explore network characteristics and patterns of social support provision with a population of interest undergoing transition.

The following chapter reviews literature relevant to the support networks of transition-age youth in foster care. The theory-oriented chapter introduces the social network perspective in general terms, applies network concepts as relevant to research with transition-age youth with foster care experience, and presents the exploratory research questions addressed with this study. The research methods chapter describes the sample and measures, explains the development of the social network instrument used here, and details how network variables are operationalized. Findings are then presented in detail, and are summarized and discussed in the following chapter. The study concludes with a discussion of study limitations and social work implications.

CHAPTER 2: Literature Review

In the child welfare field, social context is often characterized by a uniquely complex intersection of families and social services. The core purpose of child welfare intervention is to preserve families, or provide alternate permanent families that resemble the original family or cultural network as much as possible. When the state determines that child welfare intervention is required, this invariably alters family social networks by restricting some relationships (e.g., between youth and family members) and requiring engagement in others (e.g., with service providers). By policy, out-of-home foster placement is a social network intervention to remove minors from unsafe environments and connect them to comprehensive resources through a combination of formal services and informal support, including the maintenance of existing connections to family and community. Ideally, these networks would be structured in a way that allows formal and informal support providers to monitor behavior and communicate resource needs, much as a functional family network does (Coleman, 1988; Wellman & Frank, 2001), and the positive experiences and successful outcomes of many youth exiting care suggest that this is often the case. However, many older youth transitioning from the foster care system experience discouraging outcomes that indicate a lack of adequate resources and support in their social networks following child welfare intervention, though it is not clear to what degree this results from pre-existing risk factors (Berzin, 2008) or reflects a failure of the state to be an effective "corporate parent" for older youth in care (Courtney, 2009).

Recognizing the risk factors faced by many older youth exiting foster care, and reflecting the growing evidence from large panel studies documenting relatively poor

transition outcomes in the U.S. (e.g., Courtney et al., 2005, and Pecora et al., 2006), there is an emerging consensus about the importance of multi-dimensional social support and comprehensive services as these youth transition to independence (Avery & Freundlich, 2009; Courtney, 2009; Daining & DePanfilis, 2007). The primary policy response to this service need has been a "fundamental shift" towards federal funding of transition programs for older youth with foster care experience (Courtney, 2009). The current Foster Care Independence Act (1999) funds independent living programs and transition resources—generally focused on job training and employment, secondary and higher education, housing, and living skills—and requires formal transition plans for older foster youth. These programs are intended to serve youth who transition from the foster care system after age 16, whether these youth leave the foster care system for kinship guardianship or adoption before age 18, or ultimately exit foster care between age 18 and 21. Additionally, the Fostering Connections to Success and Increasing Adoptions Act (2008) extends federal reimbursement to states for foster care from age 18 to 21 for youth who are engaged in employment or education or training. In practice, extending foster care placement has been associated with improved outcomes (Courtney, Dworsky, & Pollack, 2007; Kerman, Barth, & Wildfire, 2004). Such policy interventions are designed to keep youth transitioning from care connected to institutional systems and engaged in services to support stable housing, employment, and educational outcomes.

However, there is an understanding that the most successful transitions from foster care likely unfold in the context of a network of both formal services and long-term informal support relationships (e.g., Collins, Spencer, & Ward, 2010), and it is possible

that for some older youth in care, long-term foster placement has hindered the development of an ideal support structure. Given the likelihood that this population has experienced placement instability (Courtney, et al., 2001; McCoy, McMillen, & Spitznagel, 2008; McMillen & Tucker, 1999), non-relative foster or group care (Keller, et al., 2007; Wulczyn, Kogan, & Harden, 2003), and residential treatment (McMillen & Tucker, 1999), a history of social network disruption and a potential lack of long-term relationships during adolescence may also be presumed (Samuels, 2009). Repeated network disruption likely results in sparse social networks (Collins, 2004; Perry, 2006), disengagement from formal services (Keller, et al., 2007; McCoy, et al., 2008), problem behaviors (James, Landsverk, & Slyman, 2004; McCoy, et al., 2008; Newton, Litrownik, & Landsverk, 2000), and other social adjustment challenges that may affect relationship development (Kools, 1999; Samuels & Pryce, 2008; Unrau, Seita, & Putney, 2008). Because network disruptions likely interrupt the availability of social support (Perry, 2006; Wellman & Wortley, 1990; Wellman & Frank, 2001), and because the discharge from care likely ends many child welfare services and established relationships with service providers (Courtney et al., 2001; McMillen & Rhagavan, 2009; Samuels, 2008, 2009), it is presumed that many youth are exiting foster care without the multi-dimensional resources and long-term support usually provided to transition-age adolescents through stable biological or adopted family networks (Avery & Freundlich, 2009; Collins, 2004; Samuels, 2008, 2009).

The social network functions provided through such stable support relationships may be critically important during youth transitions from foster care, and it may be that

more successful transitions can be distinguished by these supportive network factors. For example, the ideal network might be structured in a way that that facilitates regular communication to monitor youth needs and coordinate support and resources (Coleman, 1988: Wellman & Frank, 2001). Ideally, these foster youth support networks are active and interconnected, where caseworkers are in regular communication with youth relatives and kin, school personnel, and other service providers, such as counselors and foster parents. Preferably, many of these personal and service network members can also collaboratively support youth without communicating through the caseworker (given that network structure will likely change when youth no longer have a caseworker, making established ties between other members more important). Thus, a normative transition-age foster youth network might be characterized by supportive personal and service network members connected to the youth and to each other by flows of collaborative interaction over time; as such, network members can monitor youth behavior and communicate about resource needs, thereby operating as a behind-the-scenes support structure for youth, much as a functional network of family and kin does. Similar to a family network, the frequency, duration, and closeness of these formal and informal relationships can encourage network stability during transitions while transmitting norms and values that can promote positive youth development.

This scenario of established and interconnected relationships may be more likely for youth who have had stable foster placements, including relative placements, that provided a family-based (or family-like) support network. For example, Australian research shows how placement stability serves to establish patterns of ongoing informal

support ("felt security") available to youth as they transition from care (Cashmore & Paxman, 2006). Likewise, researchers in the U.K. have developed attachment-based explanations for the positive effect of stable placements on later outcomes (e.g., Schofield & Beek, 2009). However, relative to transition-age youth with stable placement histories or successful family reunifications or adoption/guardianship, some older youth in care likely have few regularly supportive relationships or collaborative ties between network members, which would limit the flow of support and resources to the youth. Further, though transitions from care are ideally well-planned through collaboration between youth, service providers, and long-term informal supports, such preparation may not be happening in some cases or some contexts, which would inhibit ongoing support during transition if these collaborative relationships have not been established.

This is not to say that the experiences of transition-age youth in foster care are uniform. Many older youth age out of care—and into stable housing, continuing education, and financial security—in transitions that are likely characterized by stable and comprehensive support over time (Cashmore & Paxman, 2006; Collins, 2004; Collins, et al., 2010). Even in the absence of family-based support or permanent guardianship, many youth feel they have meaningful social networks (Collins, 2004; Samuels, 2008). Keller and colleagues (2007) identified a large subgroup (38%) of older youth in foster care who reported placement stability, felt they had many supportive relationships, and were experiencing success in education and employment. However, these authors also profiled a larger subgroup (43%) with lower levels of perceived social support and more individual and circumstantial obstacles to successful transition. Stein

(2006a) identifies a similar recurring subgroup in his international research review. In both cases, these higher-risk profiles are characterized by placement instability, minimal engagement in services, and fewer attachments to supportive adults, including biological and foster family, all of which indicate potential constraints on the support and resources available to youth through their networks. Given these discernable subpopulations of transition-age youth in care, there is reason to begin to assess the way factors associated with problematic outcomes—such as a history of behavioral problems or placement instability—impact a youth's immediate social networks (and vice versa), and begin to consider how these network relationships may or may not be structured to address the needs of older youth exiting care.

There is limited knowledge about the support networks of youth following the transition from foster care. First, this is a time period when youth may be formally placed with biological family members or kin, or they may choose to independently reconnect with biological family members before or after leaving foster care (Collins, Paris, & Ward, 2008; Samuels, 2008). Further, many transition-age foster youth have maintained relationships with family members while in care, regardless of whether these relationships were sanctioned by the child welfare system. In their recent review, Collins and colleagues found that between 17% and 54% of youth who had exited the system were living with biological parents or relatives, summarizing that "although these families were apparently not deemed suitable for caring for the youth by child welfare authorities, young people clearly remained connected to family and sought to live with them when they could make these decisions for themselves" (Collins, et al., 2010, p.

127). In a study of formal and informal supports during transition, these authors report that 90% of former foster youth are in contact with birth families, often with siblings and mothers (67%) and other relatives (67%) (Collins, et al., 2010). In another study, adult kin were identified as "inner circle" supports more often than non-kin or peers (Samuels, 2008). Accordingly, research and practice are beginning to recognize the importance of helping older foster youth maintain or re-establish supportive connections with biological family members before and after the transition from care (Collins, et al., 2008, 2010; Goodkind, Schelbe, & Shook, 2011; Samuels, 2008).

Non-parental adults also play important formal and informal mentoring roles, and these mentoring relationships tend to be with non-parent family members, service-providing professionals, and other adults informally interacting with youth (Ahrens, DuBois, Garrison, Spencer, Richardson, & Lozano, 2011; Collins, et al., 2010). More specifically, in a sample of service-engaged young adults who had aged out of foster care, most respondents named at least one child welfare professional as supportive, but not part of their "inner circle", which reflects one of the ways that foster care experience can connects youth to both formal and informal support in a way that introduces a "unique level of relational complexity in their social networks" (Samuels, 2008, p. 76). Further, for older youth who desire independence from the child welfare system, efforts to be autonomous may hinder an ability or willingness to develop other formal and informal support relationships (Goodkind, et al., 2011; Samuels, 2008; Samuels & Pryce, 2008).

Formal and informal social support is assumed to be critically important to the safety and well-being of youth in care, and has generally been measured as youth-

perceived availability of support (e.g., Cashmore & Paxman, 2006; Courtney, et al., 2005; Daining & DePanfilis, 2007). Researchers have also begun to explore the psychological effect of network disruptions (Perry, 2006) and compositional characteristics of youth-identified networks during the transition from foster care (Samuels, 2008; Collins, et al., 2010). However, this research area is not yet distinctly informed by social network analysis, which would contextualize support provision in a wider social network structure—the pattern of direct and indirect ties between an identified set of individuals—as these network characteristics may reflect opportunities and constraints that influence youth behavior and outcomes (Wellman, 1983, 1988). For example, the level of transition support a youth receives may be related to the interconnectedness of members (network density), the range of member social roles or attributes (compositional diversity), or the stability of network structure or membership over time, all of which reflect network-level factors extending beyond direct interaction with the youth. Network analysis can be used to systematically assess these relationships to reveal how such network characteristics may influence social support provision during transitions. This approach can also be used to explore assumptions about the amount and variability of formal and informal support available to older youth in foster care based on systematic measurement of their networks.

CHAPTER 3: The Social Network Perspective

Conceptual Introduction

Social network analysis is a trans-disciplinary research approach that uses an array of measurement methods to describe the form and content of social structure and to explore determinants of individual, group, or network-level outcomes based on social network theory (Burt, 1980; Wellman, 1983, 1988). The concept of a "social network" has long been used to metaphorically describe a person's access to social resources, as represented by an individual-level attribute (e.g. perceived social support) (Marsden, 1990; Wellman, 1988). An important distinction of social network analysis is the measurement of relationships beyond a focal individual, to represent the interconnection that defines social structure and to reveal emergent properties characterizing the network as a whole (Watts, 2004; Wellman, 1983). Many researchers have used social network analysis to study how patterns of interconnected relationships allocate social resources (Wellman, 1988) to reveal "constraints placed by social structure on individual action and the differential opportunities—known variously as social resources, social capital, or social support—to which actors have access" (Marsden, 1990, p. 436; see Borgatti et al., 2009, for a brief history of network analysis as social science).

In applied network analysis, researchers are often looking for the presence of explanatory theoretical network mechanisms at work in particular social networks of interest (see Table 3.1 for theoretical concepts relevant to this network study; see Wasserman & Faust, 1994, for a primary methodological text). A *social network* refers to all the identified actors in a bounded social environment and the pattern of direct and

indirect *relational ties* that link them, however this environment and these ties are defined (Marsden, 1990; Wellman, 1983). Basic structural properties include network *size* and *density*, which is the degree of interconnection between members. The relational content of the network—the nature and the substance of the interactions between members—is also very important. Each of these relationships can be strong or weak, one-sided or reciprocated, short-term or lasting, and may consist of multiple kinds of relational ties or content (*multiplexity*). Another distinguishing quality of a network is its *composition*: do network members generally share attributes (*homophily*), or is membership diverse?

These aspects of network form and content are used to describe how the evolution of networks can facilitate the flow of social processes—such as the provision of social support—through networked relationships. For example, dense clusters of strong ties are considered network *cores*, where members are embedded in a regular flow of varied communication and activity (Morgan, Neal, & Carder, 1997; Wellman, Wong, Tindall, & Nazer, 1997). Because these relationships are interconnected, the network is structurally *cohesive* and can resist disruption of overall social processes when individual ties disappear (Moody & White, 2003). Networks cores also have a sparse *periphery* of weak ties to less-connected members who serve as links to other core networks (Granovetter, 1973; Burt, 1992). Network structure solidifies when these weak ties are developed, and expands when new connections increase the diversity of peripheral membership. In the case of social support, core network stability would facilitate regular and multi-dimensional support provision through interconnected ties, while the diversity inherent in peripheral weak ties would increase the availability of comprehensive support.

Table 3.1. *Selected Network Concepts*

Concept	Relevance	Network Measurement
Network size	Network size is a broad measure of functional capacity, often linked to social support provision (e.g. Barrera, Sandler, & Ramsay, 1981; Walker, et al., 1993).	The number of actors directly or indirectly connected to each other in a bounded network.
Relational tie	Dyadic relationships constitute network form (the presence or absence of a tie) and content (the flow of interaction through these ties). Social support provision is linked to stronger ties and particular social roles (e.g. Wellman &Wortley, 1990).	*By type*: social role (e.g. parent-child) *By characteristic*: relational qualities (e.g. frequency) (Campbell & Lee, 1991) *By content*: social interaction (e.g. support)
Tie strength	*Strong ties* (usually family and kin) tend to last and are more supportive (Wellman & Wortley, 1990). *Weak ties* are more transitory, but may serve as links to other networks (Granovetter, 1973).	The degree of a selected relational characteristic(s) (e.g. frequency, closeness, duration, etc.; Marsden & Campbell, 1984).
Multiplexity	The range of types of interaction between people (Fischer, 1982) (i.e., the breadth of a tie). More multiplex ties tend to be stronger and lasting (Degenne & Lebeaux, 2005).	Multiple ties between actors, often by relational type (e.g. neighbor and co-worker) or content (e.g. emotional and concrete support).
Density	Interconnection among network members indicates embeddedness, which is associated with lasting ties and support provision (e.g., Degenne & Lebeaux, 2005; Wellman & Wortley, 1990).	The degree to which possible dyad ties are actually present in a network (*transitivity* measures triadic ties; e.g., Louch, 2000).
Cohesion	Describes the pattern of densely connected, strong ties indicating network stability (Moody & White, 2003) and bonding social capital (Coleman, 1988).	Usually a combination of tie strength and density/transitivity.
Social Capital	A bonding mechanism linked to dense networks of strong ties (Coleman, 1988) and a bridging mechanism linked to peripheral weak ties between networks (Burt, 1992).	Varies widely (see Lin, 1999, for discussion). Social capital is not measured in this study, and is used here for framing purposes.
Core-periphery structure	Functional networks tend to have a cohesive core of strong ties with a periphery of weaker ties (Morgan, et al. 1996: Wellman, et al., 1997).	Varies by study, depending on how ties are measured and theoretical interest.

Note: Measurement examples apply to the personal network methods used in this exploratory study.

An emergent characteristic of networks that illustrates their functional value is *social capital*, which can be understood as the available and accessible information, resources, and social support that individuals can draw on through their relationships with others (Coleman, 1988). Social capital is often conceptualized as a *bonding* function of strong and stable ties to family and community (Coleman, 1988), and a *bridging* function of more transitory weak ties to people outside of one's close network (Burt, 1992). Bonding capital requires *social closure,* in that members of one's network know each other and jointly influence attitudes and behavior, including a reciprocal obligation to provide support (Coleman, 1988). This embeds individuals in a dense core of predictably supportive relationships developed over time. On the other hand, bridging social capital exists when individuals can use their network connections to obtain information and resources beyond the reach of their core relationships (Burt, 1992; Granovetter, 1973). Core networks tend to be composed of members with similar attributes (*homphilous*; e.g. McPherson, Smith-Lovin, & Cook, 2001), but bridging capital depends on weak ties to a compositionally diverse periphery of members with ties to other networks.

Although the concepts of social capital and social support are not equivalent, when they are both considered representative of "networked resources" in the context of specific desired outcomes, social capital can be used to conceptually describe emergent patterns of network-based resources in social support networks in terms of network shapes and attributes that "incur advantages, and to whom, under what circumstances" (Kadushin, 2002, p. 88; Kadushin, 2012). It has been specifically argued that in the context of research relating to child-rearing institutions and non-traditional families, the

concept of social capital is best used as a descriptive "tool or heuristic device for exploring processes and practices that are related to other forms of capital" (Morrow, 1999, p. 757). Further, it has been argued that the application of social capital concepts in a social work framework, particularly regarding youth development in the context of networks with limited support and resources available, requires localization of social capital as a personal network resource that can be assessed in a way that guides intervention (Laser & Leibowitz, 2009). These perspectives inform the descriptive use of social capital as a framing device in exploratory network analysis related to social support provision in vulnerable youth networks.

This study specifically draws on a branch of network research assessing social support in *personal networks* (e.g. Agneessens, Waege, & Lievens, 2006; Tracy, Whittaker, Pugh, Kapp, & Overstreet, 1994; Wellman & Frank, 2001). Generally, personal networks include a focal person's strong, multi-dimensional ties to family and kin, which are usually relied on for emotional support and significant aid, as well as the various relationships of proximity or convenience which may provide day-to-day informational and concrete support (e.g. Wellman & Gulia, 1999; Wellman & Wortley, 1990). This study defines a youth's personal network as the formal ties to service providers (e.g., foster parents and caseworkers), connections to post-secondary educational or training programs, and informal relationships with family, friends, and community. Measurement of this network structure also includes the presence of ties between network members (e.g. Marsden, 1987; Wellman, 1979), such as a relationship between a maternal grandmother and a foster parent. Social network analysis is applied

here as a way to describe the form and content of youth personal networks, to assess the provision of social support as these youth transition to college, and to evaluate differences in network variables over time and by individual level predictors of interest to the child welfare field, such as living situation and race/ethnicity.

Network Analysis with Transition-Age Youth in Foster Care

Applied Network Analysis

The introduction of social network methodology is appropriate when there is a theoretical reason to believe that operationalizing a particular network property will meaningfully contribute to substantive prediction in a way that traditional individual-level attributes do not (Marin & Wellman, 2010). Given a hypothesis grounded in network concepts, researchers can model network-, tie-, or individual-level outcomes using network-, tie-, or individual-level properties as the unit of analysis, to account for the influence of emergent social network patterns on the behavior and outcomes of focal individuals (Carrington, Scott, & Wasserman, 2005; Marin & Wellman, 2010; O'Malley & Marsden, 2008; Walker, Wasserman, & Wellman, 1993). This study reflects an preliminary interest in social network properties as they may relate to formal and informal support provision for transition-age youth with foster care experience. Here, network-level measures will be explored by individual-level youth factors and compared over time, and network relationships will be analyzed at the tie-level.

At its simplest, this methodology can be applied to describe the structural form and relational content of transition-age youth support networks to generate new network-based knowledge about patterns of support provision in this population of interest.

Networks can be described by the indicators introduced earlier, including structural variables of size and density, or content-specific relational variables reflecting the flow of support through ties of various types (e.g. service-providing) and characteristics (e.g. strength, multiplexity). Further, structural network indicators like size and composition can be associated with relational content, in this case, the direct provision of support (Agneessens, et al., 2006; Tracy & Whittaker, 1990; Walker, et al., 1993; Wellman & Frank 2001). Personal network analysis can meaningfully delineate the nature and degree of support provided through different kinds of relationships (e.g. family versus friends), and account for ties between network members, to identify patterns associated with support provision. The identification of subpopulations of transition-age youth in foster care with distinct levels of service use and perceived support (Keller, et al., 2007; Stein, 2006a) suggests that identifying network-based patterns of personal support and service provision can contribute to understanding how individual risk attributes may translate to transition outcomes.

When first introduced in a field, applied social network analysis is often an exploratory innovation to detect the presence of explanatory network processes at work. Therefore, there are no *a priori* hypotheses for this study; rather, this is preliminary research intended to demonstrate how well these network concepts can be measured and analyzed with this specific social work population, in terms of theoretical application and construct validity, reliable longitudinal measurement, and the observation of correlational patterns, group differences, or emergent properties that are expressly relevant to child welfare practice. That is not to say that exploratory findings of interest will not be

evaluated and discussed in terms of how they may inform future research with youth transitioning from foster care, or more specifically, research with relatively high-functioning youth with foster care experience who are involved in post-secondary education. Rather, it is to clarify that the purpose of this small-sample study is to assess how well this adaptation of social network methodology works as applied here with this population, and to evaluate whether similar research should be conducted on a larger scale, from which substantive conclusions may be more confidently drawn. Therefore the research questions are intentionally broad and the multiple aims for each question reflect the multiple analytic approaches that were attempted to address this purpose.

Network Research Questions

The first research question aims to describe these personal networks in terms of structure, composition, relational qualities, and support provision through these relationships. First, structural measures of size and density are both considered important correlates of support provision in networks, where network size reflects support capacity (Walker, et al., 1993) and more interconnection among a group of people increases the "bandwidth" (Kadushin, 2012, p. 105) through which needs can be monitored and support provided to group members. However, density and size are generally presumed to be negatively correlated (Kadushin, 2012), where the larger a network is the less likely it is that all parties are able to sustain relationships with each other, and there may be interest in whether and how these structural indicators interact in the personal networks of older youth with foster care experience. It may be that smaller but more dense core networks provide more support per member (e.g. Marsden, 1987; Wellman & Gulia,

1999), and perhaps the additional presence of connections between formal and informal providers specifically increases overall support (Pescosolido, 1992; Stiffman, Pescosolido, & Cabassa, 2004). Or it may be the case that larger networks provide more comprehensive support coverage through diverse weak connections giving targeted support when needed (e.g. Haines & Hurlbert, 1992), versus smaller networks composed of strong, multi-dimensional ties providing day-to-day support. This study includes size and density as indicators that may each be positively correlated with support provision and negatively correlated with each other.

Member composition is another indicator that may distinguish these networks in important ways. It has been long understood that "healthy adolescent development requires a balance of support from family, formal associations (teachers, counselors, etc.) and informal support systems such as friends and same-age peers" (Johnson, Whitbeck, & Hoyt, 2005, p. 232, citing Cauce, Felner, & Primavera, 1982). This compositional diversity of support may or may not be present in a population of youth with foster care experience, or in subgroups of youth with different foster care experiences, and may or may not be associated with support provision in these networks. For example, in a study of predictors of homeless and runaway adolescent networks, compositional diversity was predicted by network size (Johnson, et al., 2005). This study is interested in the presence or absence of network members by social role category (here operationalized as *family*, *friends*, *school/work*, and *other*) and also includes categorical diversity as an indicator of the compositional breadth of supportive relationships in these networks. Further, there is particular interest in parent figures and service-oriented ties in these networks, which are

presumed to be critical providers of different kinds of support; potentially, the network-level prevalence of these roles may be associated with support provision, and at the tie-level, these roles can be explored as predictors of tie strength and stability.

These descriptive social network indicators may also differentiate subpopulations of youth with foster care experience by individual-level variables traditionally studied in child welfare research. For example, placement type may differentiate groups of youth by network size, average tie strength, or compositional diversity. It may be important to know whether transition-age youth living with foster family have larger or more diverse networks providing varied sources of formal and informal support, or whether youth living with biological family members have denser networks or stronger ties, if these network indicators are associated with support provision in ways that could influence youth outcomes. Race/ethnicity may also distinguish groups of youth on these network variables. For example, there is evidence that child welfare service disparities exist by race/ethnicity (Courtney, Barth, Berrick, Brooks, Needell, & Park, 1996)—such as higher unmet mental health service needs for African American and Latino youth compared to Caucasian youth (Garland, Landsverk, & Lau, 2003)—and such disparities may be detectable through network indicators of service-providing relationships. There may also be differences in network descriptors by race/ethnicity due to cultural patterns that may be observable in this sample. For example, Hispanic personal networks have been shown to be more kin-oriented, compared to Anglo networks that have a balance of kin and friends (Schweizer, Schnegg, & Berzbon, 1998), and this compositional difference may be associated with patterns of support provision. Here, living situation and race are

included as individual-level predictors that may specifically distinguish youth networks in terms of structure, composition, and support provision.

In addition to allowing for innovative description of these support networks, further analysis of these structural, compositional, and relational properties may reveal correlational patterns that can be used to describe "profiles" of youth networks that are associated with support provision as a dependent variable. Ideally, these profiles can be framed in terms of social capital as an emergent property, where bonding capital may be indicated by dense cores of strong ties providing multi-dimensional support, and bridging capital indicated by the presence of diverse weak ties providing targeted support (as summarized in Kadushin, 2012). Although this study does not specifically attempt to quantify social capital, emergent patterns of support provision are characterized in terms of social capital to illustrate how multiple network indicators may function together to facilitate or inhibit support provision in these youth networks.

The first broad research question combines the above objectives to establish that this methodology provides meaningful network descriptions that are relevant to child welfare research and practice:

I. **What is the form and content of these support networks?**

   Aim: *Describe support networks by network-level characteristics (structure, composition, relational qualities, and support provision).*

   Aim: *Compare network characteristics by race/ethnicity and living situation.*

   Aim: *Explore networks by correlational patterns of structure, composition, relational qualities, and support provision.*

If network properties can be meaningfully described and can be associated with support provision with this population, then it is also important to evaluate whether network-level properties are stable over time or change during transition in ways that influence social support provision. Network stability can be defined as "the tendency to reproduce the same basic features of the social network across multiple elicitations of that network" (Morgan, et al. 1996, p. 12), and this can be considered in terms of the stability of network properties, like size and composition, and also stable network membership over time (Morgan, et al., 1996; Suitor, Wellman, & Morgan, 1997). To assess network stability, Feld, Suitor, and Hoegh (2007) suggest that changes in personal networks can be considered at the network level, in terms of the expansion and contraction of networks and changes in structural characteristics, and at the tie level, to consider the characteristics of relationships that come and go relative to those that are stable ever time. Here, network-level change can be considered in terms of structure, composition, relational characteristics, and support provision.

Further analysis conducted at the tie-level can be used to explore relationship properties as independent or dependent variables, as opposed to analyzing network-level properties (e.g. average network tie strength). First, tie-level stability—in terms of ties that are repeatedly named in the networks over time relative to ties that are transitory—can be used as a dependent variable predicted by tie characteristics and types of support provision. Tie characteristics and support content may also be differentiated by the type of relationship (e.g. parental, or service-providing), and the compositional category. For example, one may be interested in whether relationships categorized as family are more

likely to be stable or to provide certain kinds of support (as would be expected; e.g. Wellman & Wortley, 1990). In this context, there is also particular interest in the service-providing relationships that are represented in these networks, and these may vary by strength, support type, and stability.

Tie-level stability can also be aggregated to explore member stability at the network level. With this population, we may expect some network turnover related to service provision (as youth begin or end ties to providers), and given the age of the sample, we may expect some normative instability in living situation, or work or school involvement, or friendship ties. Morgan et al. (1986) suggest that there may be two sources of stability in networks, even when there is member turnover over time: the first is "a core set of ties that both anchored the composition of the network across different measurement points and had relatively stable characteristics" and the second is "a more peripheral set of ties that came and went but were relatively interchangeable, so that different samples from these ties would make essentially the same contribution to the network's aggregate characteristics" (p. 20-21). Importantly, these are not mutually-exclusive sources of stability, and either or both may influence network-level properties over time (Morgan, et al., 1986). Similar to indicators of bonding and bridging capital, assessment of the presence of such sources of stability in these networks could allow for the study of emergent characteristics that may be influencing support provision over time.

For now, this study addresses the following research aims related to the stability of network form, content, and membership over time, as well as exploration of tie characteristics:

II. **How does youth network form and content change over time?**

Aim: *Explore network-level change and membership stability over time.*

Aim: *Explore network-level change and membership stability by individual-level predictors (race/ethnicity, living situation, and cluster).*

Aim: *Compare tie-level characteristics and support by tie-level role, category, and stability.*

Lastly, this methodology has been adapted for use with a specific population, and there are reliability risks and an incentive to establish the validity of the network analysis conducted here. Therefore, this study also evaluates the reliability of the network instrument to capture network form and content with specificity and sensitivity over two time points. This includes comparative measures of the social roles in these participants' lives to assess construct validity in terms of selected traits, qualitative exploration of respondent reasons for why ties come and go between measurements, and evaluation of whether member turnover is due to measurement error versus actual changes in networks. Additionally, the enacted support measured by the network instrument can be compared to more traditional measures of perceived availability of social support to evaluate the relationship between these distinct concepts (Barrera, 1986) as measured here.

This study includes assessment of reliability and validity as a separate research question to inform future use of this instrument and methodology with this population:

III. **Is this methodology a valid way to measure and analyze these networks?**

Aim: *Evaluate the reliability of the network instrument.*

Aim: *Evaluate the construct validity of the network instrument.*

CHAPTER 4: Methods

Research Design

This study uses data collected as part of the evaluation of the Coaching for College Success (CCS) pilot project based at The Inn Home, a non-profit Independent Living Program (ILP) in Portland, OR. The project is a mentoring program for youth with foster care experience who are enrolled in post-secondary education or training, with a focus on increasing academic support and career preparation. The IRB-approved program evaluation (HSRRC # 111643) primarily assesses the effect of the mentoring intervention on academic and career-oriented outcomes by measuring post-secondary enrollment, extracurricular involvement, career preparation activities, and social networks and social support. Program evaluation data were collected from CCS mentees and a non-equivalent comparison group of post-secondary students with foster care experience who chose not to be matched with a CCS mentor. Participants were not randomized into groups; the decision to participate in the mentoring component determined group membership.

This secondary analysis of the evaluation data specifically explores aspects of the youth support networks (HSRRC #11842), as measured by the social network instrument developed for the program evaluation (Appendix A). The focus here is on measures of network form and content at baseline and follow-up, and independent variables include demographic items from the program evaluation. Although a comparison group was originally included in the program evaluation design, in this study, the network data from the groups is pooled for analyses and effectiveness of the mentoring intervention is not specifically addressed or evaluated.

Sample and Procedures

Participants in this study are youth who were eligible for the CCS intervention. These are young adults (age 18 or older) with foster care experience who were either already enrolled in a post-secondary education or career training program, or who planned to enroll within six months of the start of the intervention. Youth participants were recruited through the ILP and local community college programs specifically serving youth with foster care experience (e.g. on-campus TRIO programs for students from disadvantaged backgrounds). The sample is described in Table 4.1 below.

All CCS participants were invited to take part in the data collection for the program evaluation. As youth were recruited by phone and email, staff arranged one-on-one meetings with those who were interested in being matched with a CCS mentor. Program staff asked youth who were not interested in having a CCS mentor if they would like to participate in data collection for the evaluation; those who agreed to participate in the data collection alone constitute the comparison group. Written informed consent was obtained from all participants prior to data collection. Time 1 (hereafter, "T1") data collection took place between January and March of 2011. Time 2 ("T2") data collection took place between October and December of 2011. The follow-up measurement was intended to occur 6 months after baseline (August–October). However, this didn't allow for accurate measurement of post-secondary enrollment as an outcome (as many youth might not enroll in the summer) and the measurement interval was therefore extended until after fall term started at the local colleges where most participants were enrolled. The mean time between baseline and follow-up measurement was 7.37 months (SD=.25).

At T1, youth completed the paper-and-pencil CCS program survey and social network instrument one-on-one with program staff (including this author) at the ILP, on campus, in the community, or at their homes. In most cases, data collection took 30-45 minutes. Youth were given $10 for their time and permission was obtained to contact them for follow-up data collection. Only first names or initials were used in the data collection and youth names were replaced with participant identification numbers to preserve confidentiality. The same procedures were followed at T2, with the addition of measures to assess the mentoring relationship (for intervention participants only, not included here), and to explore the validity and reliability of the network instrument (described below). All data are kept in password-protected electronic files or locked file cabinets at the ILP (The Inn Home) and Portland State University.

Sample Description

At Time 1, there were 34 participants, with 21 in the mentoring intervention group and 13 in the comparison group. There were no statistically significant differences between the intervention and comparison groups by race/ethnicity, living situation, or age. Although intervention group assignment is not a focus of the network-oriented study reported here, the two groups of participants had differing levels of program involvement, which could potentially affect the success of retention efforts at Time 2. However, 10 of the comparison group participants were retained (77%) and 17 of the intervention group were retained (81%), for an overall retention rate of 79% (27 of 34 retained). There were no statistically significant differences in retention rate by race/ethnicity, age, living situation, or intervention group. The baseline sample is described in Table 4.1 below.

Table 4.1. *Sample demographics*

		Time 1 (N=34)	Time 2 (N=27)
Gender	Female	22 (65%)	20 (74%)
Age	Mean (*SD*)	19.62 (1.23)	20.27 (.245)
Race/Ethnicity	White	18 (53%)	12 (44%)
	Black/African American	7 (21%)	7 (26%)
	Hispanic/Latino	4 (12%)	4 (15%)
	Other or mixed race[a]	5 (15%)	4(15%)
Living situation	Lives with foster or adoptive family	15 (44%)	8 (30%)
	Lives with biological family	4 (12%)	4 (15%)
	Lives alone	5 (15%)	7 (26%)
	Lives with others (partners and/or roommates)	10 (29%)	8 (30%)
Post-secondary enrollment	Not enrolled	2 (6%)	6 (22%)
	Community college transition program	2 (6%)	2 (6%)
	Enrolled in community college	26 (76%)	15 (56%)
	Enrolled in college/university	2 (6%)	3 (11%)
	Enrolled in other training program	2 (6%)	1 (4%)
Change in living situation reported at T2	Living with others to living alone (or vice versa)	-	5 (19%)
	Living with foster family to living alone or with others		2 (7%)
	Living with foster family to living with bio. family		1 (4%)
	Living with others to living with biological family		1 (4%)
	Living with biological family to living with others		1 (4%)
Other transitions reported at T2	Started working somewhere new	-	9 (33%)
	Stopped working somewhere		10 (37%)
	Started taking classes somewhere new		5 (19%)
	Stopped taking classes somewhere		6 (22%)

[a]Includes participants who identified their race/ethnicity as follows at T1: White and Black/African American (n=2), White and unknown race (n=1), other Asian (n=1), and American Indian/Alaskan Native (n=1).

Program Measures

Participants were assessed with several measures, as described below.

Youth demographics. Age, gender, race/ethnicity, living situation, and post-secondary program enrollment status, as reported on the CCS program evaluation survey.

Perceived social support. The Medical Outcomes Study Social Support Survey (MOS; Sherbourne & Stewart, 1991) measures the perceived availability of functional social support overall, and by four subscales representing distinct types of support: emotional/informational support, tangible support, affectionate support, and positive social interaction (Appendix C). MOS scores are compared to the social support provision measured by the network instrument, primarily to test reliability and validity.

Youth living situation. Response choices were: (a) I live in the dorms on campus; (b) I live with my foster family; (c) I live with my bio family; (d) I live in an apartment by myself; (e) I live in an apartment with roommates; or (f) other. Only one youth lived in a dorm, so this was collapsed with living with roommates. Cases in which "other" was selected (e.g. "with boyfriend in a house") were collapsed with the closest category (e.g. living with romantic partners was collapsed with living with roommates and re named "living with others"). The final categories used for analysis are listed in Table 4.1.

Social roles list. A list of both general (e.g. sibling) and specific (e.g. caseworker) social roles that might be expected to provide support to the participants was created for comparison with the network instrument (Appendix C). This measure is described in detail in the results for Research Question III, with an explanation of how the roles list was used at follow-up to test network measurement reliability and validity.

Social Network Measurement

Network Instrument Development

The network instrument was originally developed to sensitively measure support provision before and after a brief, targeted mentoring intervention. Given an intervention focus on increasing support through new network connections in multiple domains, the instrument was developed to measure participant networks in terms of the quantity and quality of supportive connections. See Appendix B for the social network instrument and administration protocol.

The design of the network instrument was based on established name-generating methods for personal network analysis (e.g. Campbell & Lee, 1991; Marin & Hampton, 2007; Marsden, 1990; Wellman & Wortley, 1990). The social network "map" and "grid" are specifically adapted from instruments developed by Tracy and Whittaker (1990) to assess client support network characteristics for practice purposes. These assessment instruments have since been adapted to measure individual-level network attributes—specifically, support network size and composition—with various client populations for research purposes (e.g. Kef, Hox, & Habekothe 2000; Robertson, et al., 2001; Tracy & Johnson, 2007; Tracy & Martin, 2007). Though conceptually similar, an important distinction of the instrument used here is the measurement of the interconnected web of relationships between and among all identified network members, in this case, based on participant knowledge of these inter-member relationships. This allows for network-level measurement encompassing a focal person and his or her ties, as well as the ties between all individuals other than the focal person, as described below.

A few instrument design and administration choices warrant explanation. First, the network map was used as a name generator to "brainstorm" names of supportive network members without specification of the nature of that support ("who are the people who supported you in the last year?"). Respondents were asked for first names or initials only, and were assured that the instrument was not to collect any personal information about the people they know, but rather to assess the kinds of support they were getting through the various relationships in their networks. Pilot tests indicated that adding social role categories (*family*, *friends*, *school/work*, and *other*) to the instrument helped respondents generate and organize names, although arguably these predetermined categories may have limited recall of members in other specific social roles (e.g. neighbor). Such differences in the relative strengths and weaknesses of various personal network name-generating methods are well-documented (e.g. Campbell & Lee, 1991; Marsden, 2005; Marin & Hampton, 2007). Youth networks were measured at Time 2 following the same protocol as Time 1, with additional probing about any ties named at Time 1 who are excluded at Time 2 (Feld et al., 2007; Wright & Pescosolido, 2002), and vice versa (see Appendix C).

Respondents were next asked to indicate, to the best of their knowledge, the presence of relationships between the people they identified. Ideally, these ties are confirmed by each network member, but this is often neither practical nor expected in personal network analysis (Marsden 2005; Wellman, 2007). Although this common approach for measuring inter-relationships in personal networks is inexact, there is benefit in using a broad measure to allow for consideration of basic network structural

properties. For example, researchers have recently used similar methods to measure personal network density in an effort to predict substance use in a similarly-aged homeless and runaway youth sample (e.g. Rice, Milburn, & Monro, 2011). In this case, the interconnection (*density* and *transitivity*) of the youth networks may be differentiated by predictors of interest in child welfare research, such as race/ethnicity or living situation.

After names were brainstormed using the network map, respondents were asked to identify which of these relationships were supportive "at least monthly" to identify the more regularly supportive "core" network. This was done to make network measurement more manageable for respondents (and for analysis) by distinguishing more regularly supportive members from those from whom received support was too ambiguous to reliably describe in narrow terms by type and domain. This also allowed the respondents some flexibility to identify people who were important figures in their social network, even if these relationships were perhaps not very supportive (as support was defined here); this was a concern when administering the network instrument with youth in foster care, some of whom may have conflicted relationships with some people in their lives, and some of whom struggled to name more than a few people in the brainstorming stage.

Lastly, the social network grid (often called a *name interpreter*) details three distinct aspects of the regularly supportive ("at least monthly") relationships in the respondent networks. These are known as *relational type*, *relational content*, and *relational characteristics* (Campbell & Lee, 1991). First, relational type is the social role of the network member, as this was determined by the respondent (e.g., mom, boyfriend,

teacher, etc.). Next, relational content was specified as the provision of three standard social support types (*emotional*, *instrumental*, and *concrete*; e.g. Tracy & Whittaker, 1990) within each of four support domains targeted by this program (*academic support, career prep, extracurricular,* and *social support)*[1]. Upon pilot testing of the original instrument design, support types were relabeled so that for each network member, respondents identified whether they "talk to them" (emotional), "get info/guidance" (informational), and/or "ask for favors" (concrete) within each domain. Lastly, respondents indicated relational characteristics in terms of the frequency of support (*monthly, weekly, daily*), closeness of the relationship (however defined by the participant; *not close, close, very close*), and duration of the relationship (*less than a year, 1-5 years, more than 5 years*), to measure tie strength (Marsden & Campbell, 1984). Although these are common measures of relational strength in network studies, the categories were selected based on an expectation of how participants in this sample might easily delineate different kinds of relationships, and previous pilot testing with a similar sample.

Network Measures

Youth network variables are gleaned from the social network map and grid instruments (see Appendix B). See Table 3.1 to revisit broad definitions of relevant social network concepts and related measurement guidelines. Table 4.2 below provides more detailed explanation of how these networks concepts are operationalized in the current study.

[1] Note that this study reports total support in all domains, and specifically within the academic and career domains, but does not delineate the extracurricular and social support domains. This may be a measurement-related limitation, as discussed in Chapter 5

Table 4.2. *Network measurement*

Concept	Measurement
Network size	This is the number of people included on the network map (the name generator). The number of members transferred to the network grid (the name interpreter) is the size of the "core" support network for this study. The core is limited to ten network members who provide monthly support. Network and core size are also analyzed as the ratio of network-to-core size, and the ratio of Time 2 network size to Time 1 network size.
Relational type	This is the broad category within which each network member is placed on the network map, from which composition (e.g. the number people listed in the *family* category) and diversity (the number of categories with at least one member) measures are drawn. Additionally, the more specific role descriptions on the network grid are used to create variables indicating the prevalence of service-providing relationships (caseworkers, ILP workers, teachers/tutors, counselors, etc.) and "parent figure" ties (mother and father, foster parents, grandparents, and aunts/uncles) in the core networks.
Relational content	Network-level content is calculated in terms of total types of support provided in the four intervention domains, for an aggregate measure of total support (0-12 range) and total support by type (0-4 per type). To control for core size, additional variables include average support per tie and the proportion or degree of support provision by type and domain for each core network. For each core tie, a tie-level measure of multiplexity counts how many of the three support types a tie provides.
Relational characteristics	For each network, characteristics of tie frequency, closeness, and duration are averaged separately (0-3 range) and also combined for a measure of overall tie strength in the core network.
Density	Network density is calculated as the degree of interconnection between members indicated on the network map overall, and between members in the core network specifically (not counting ties to the respondent). This is done by creating a matrix of identified members for each network and indicating the presence of a tie between each pair of names on the map. Network density is the degree to which possible ties between each pair are actually present (0-1.0 range; Wasserman & Faust, 1994). The core density variable limits the network members to the core ties only.
Transitivity	Network transitivity usually refers to the number of connected triads in a whole network and indicates whether members tend to cluster in dyads or triads. There is exploratory interest here in whether triads are present across compositional categories, to distinguish from density, which is not sensitive to category (i.e. a highly dense network could indicate interconnection only within the family category, but transitivity would indicate cross-category connections). Transitivity is measured here as the proportion of all possible ties that are actually present between members of different network categories.
Network-level and tie-level stability	To consider network stability over two measurements, all the unique ties from both elicitations of the network can be aggregated and classified as present at T1 only, at T2 only, or present at both T1 and T2 (Morgan et al., 1996). The degree to which all core ties are present at both time points is used to indicate network-level stability for each participant, and tie-level analysis explores predictors of tie stability.

Research Questions

The purpose of this study is to: (1) describe the personal support networks in this sample, and associate these network-level variables with individual-level predictors and patterns of support provision, (2) assess changes in youth network form, content, and membership over time, and (3) and evaluate the reliability and validity of the network measure with this population. The research questions are:

I. What is the form and content of these support networks?

Aim: *Describe support networks by network-level characteristics.*

Aim: *Compare network variables by race/ethnicity and living situation.*

Aim: *Explore networks by correlational patterns of structure, composition, relational characteristics, and support content.*

II. How does youth network form and content change over time?

Aim: *Describe network-level change and membership stability over time.*

Aim: *Explore network-level change and membership stability by individual-level predictors (race/ethnicity, living situation, and cluster).*

Aim: *Compare tie-level characteristics and support by role, category, and stability.*

III. Is this methodology a valid way to measure and analyze these networks?

Aim: *Evaluate the reliability of the network instrument.*

Aim: *Evaluate the construct validity of the network instrument.*

This study uses SPSS 19 for bivariate and multivariate analysis. UCINET (Borgatti, Everett, & Freeman, 2002) is used for matrix-based network analysis and NetDraw (Borgatti, 2000) is used for network visualization.

CHAPTER 5: Results

Research Question I: What is the form and content of these support networks?

Aim: Describe youth support networks by network-level characteristics.

The first aim of this research question is simply to describe the network data gathered from participants at baseline to begin to explore ways these networks can be effectively summarized in terms of structure, member composition and relationship characteristics, and support provided, as measured with the network instrument. This includes average network characteristics for the sample, which are provided as overview, and as a reference for later analyses using these same variables. Additionally, the member composition of these networks is described and illustrated in ways intended to be relevant to practice with this population; ideally, practitioners would be able to "recognize" different kinds of support networks based on experience working with this population.

Table 5.1 shows descriptive statistics for the primary network variables at T1 (see Table 4.2 for variable descriptions). These are the network indicators used throughout this study, although they are sometimes transformed, as will be described when relevant. For example, composition is analyzed and reported as both the number of network members in each category and proportionally (e.g. the number of core members in the Family category on a 0-1.0 scale). In some analyses, categories are collapsed (specifically, the School/Work and Other categories may be combined as "SWO"). Many of the T1 variables are not normally distributed, but meet normality assumptions at T2. Where appropriate, non-parametric tests are used and described. Note that because of the small sample size, this study uses the Shapiro-Wilk test for normal distribution.

Table 5.1. *Network-level descriptive variables at T1(N=34)*

		M	*SD*	Min.	Max.
Network structure *(how many people and how interconnected)*	Network size	10.65	4.01	3	19
	Core size (0-10)	6.79	2.66	3	10
	Network density (0-1)	.266	.19	.05	.78
	Core density (0-1)	.315	.22	.00	.78
	Transitivity (0-1)	.049	.09	.00	.39
Network composition *(people in each category on the map)*	Network diversity (0-4 categories)	3.38	.70	1	4
	FAMILY	2.94	2.20	0	9
	FRIENDS	3.71	1.95	0	8
	SCHOOL/WORK	2.21	2.03	0	8
	OTHER	1.82	1.40	0	5
Core composition *(people in each category on the grid)*	Core diversity (0-4 categories)	2.85	.89	1	4
	FAMILY	2.41	1.89	0	8
	FRIENDS	2.38	1.71	0	7
	SCHOOL/WORK	.82	1.11	0	4
	OTHER	1.06	1.07	0	3
	Parent roles[a]	1.65	1.45	0	5
	Service roles[b]	1.35	1.23	0	5
Relational characteristics	Overall tie strength (1-3)	2.21	.26	1.57	2.67
	Frequency (1-3)	2.09	.42	1.00	2.70
	Closeness (1-3)	2.32	.32	1.30	2.80
	Duration (1-3)	2.25	.40	1.30	2.80
Support provided[c]	Total support (0-120)	45.12	24.60	8	103
	Emotional support (0-40)	18.29	10.07	1	35
	Informational support (0-40)	14.68	8.99	1	35
	Concrete support (0-40)	11.47	7.91	0	36
	Academic domain (0-30)	12.24	6.99	0	26
	Career domain (0-30)	10.24	6.42	2	26
	Degree of support from core (0-1)	.54	.22	.17	1.00
	Degree of emotional support (0-1)	.68	.29	0	1.00
	Degree of info. support (0-1)	.53	.26	.03	1.0
	Degree of concrete support (0-1)	.43	.26	0	1.0
	Degree of academic support (0-1)	.57	.29	.00	1.00
	Degree of career support (0-1)	.50	.24	.10	1.00

Note. Shaded variables are of particular interest in this study.

[a]Includes parents, step-parents, foster parents, grandparents, aunts/uncles.

[b]Includes child welfare and ILP caseworkers, post-secondary program teachers/staff, or any paid workers.

[c]Total support variables are based on measurable support within type or domain. "Degree" is the proportion of support provided based on the number of core ties (i.e. controlling for core size).

Starting with Table 5.1, note the distinction between structural variables, reflecting network size and interconnectedness, and compositional variables reflecting the categorization of members on the network map and within the core network. Relational characteristics are the average tie properties for all the core ties for each network, and support provision reflects the total support per core network by type and within two domains of interest. Throughout this study, these support totals are also analyzed and reported as the degree of support (support per tie, or "supportiveness") provided by each core network, which controls for the core size (e.g. this distinguishes between a large core that provides lower emotional support per tie, and a smaller core where ties are more emotionally supportive on average).

Network Structure and Support Provision

As reported in Table 5.1, the baseline networks include many ties providing varying levels of support by type and domain. Recalling that network size is a proxy for support capacity, these networks include, on average, 11 supportive network members (-*M*=10.65, *SD*=4.014), and respondents identify 64% of these ties (*M*=6.69, *SD*=2.660), as members of a more regularly-supportive sub-network. This overall network size is comparable to personal network size measured similarly with a similarly-aged (18-22) homeless and runaway population (*M*=13 network members, *SD*=8; Rice et al., 2011), although there is less variance in network size in the current study. When networks are narrowed down to monthly supports, these cores are providing less than half of the support measurable using this instrument, on average, in total and for all support types; however, the core ties that are identified are providing at least half the potential support

they could be providing, per tie, on average. Emotional support is most often provided, in total and per core tie, followed by informational support, and lastly, concrete support.

The average density, or degree of interconnection between members relative to all potential ties, is .27 for the networks overall, and .32 within the core network, and it is expected that the core would have more interconnected ties as a function of stronger core ties[2]. Degenne and Lebeaux (2005) measured density similarly and report comparable interconnection (*M*=.26–.31 over three waves) between members in the personal networks (defined as "people who are important to you") of college-age youth. Using similar methodology for assessing interconnection in the networks of homeless and runaway youth, Rice and colleagues (2011) also report comparable density (*M* =.20, *SD* =.21), albeit with more variance than is reported here, between ties in personal network members who the respondent "interacted with" in the previous month.

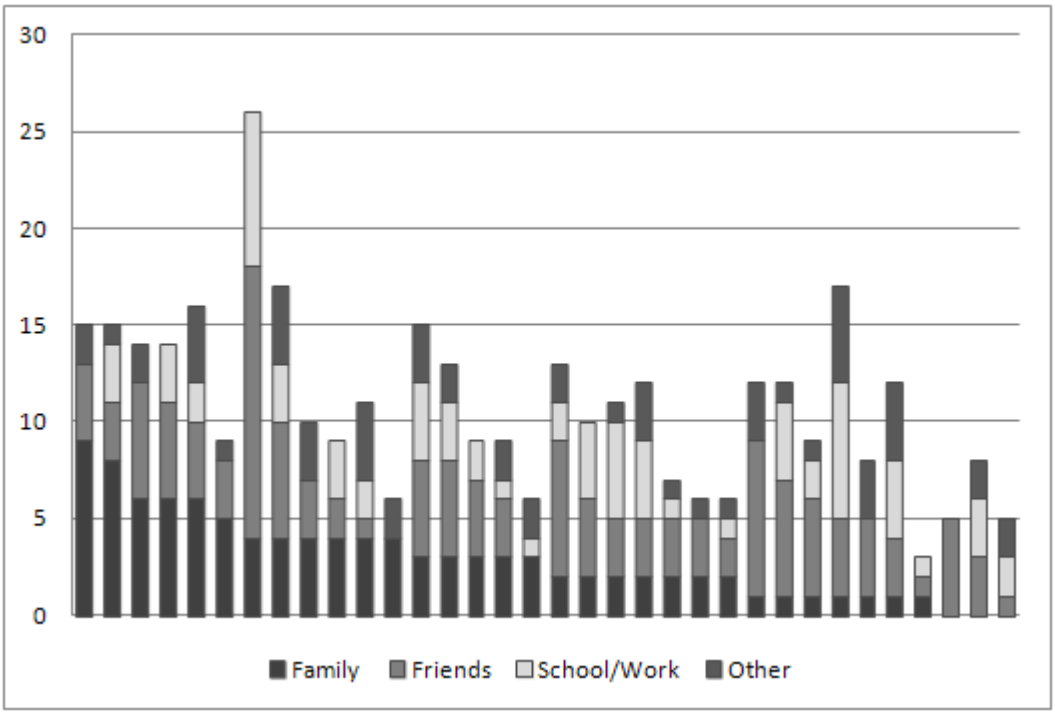
Network Composition

The number of members participants could put on the network map was not constrained, and Figure 5.1 shows the distribution of ties in the T1 networks by compositional category. Overall, these support networks are compositionally diverse, with three of four possible categories named on average at baseline and follow-up (T2 not shown), though core networks are less diverse and tend to have between two and three categories represented. Note that participants were instructed to put network members in the category they choose, with the caveat that the "Other" category could include caseworkers, mentors, counselors, or anyone else they didn't put in another category. The

[2] This was not the case for all networks, some of which had higher density in the network than the core. For example, if the network map included a dense group of Family and a dense group of Friends, but only a few of these were core ties, making the core less dense than the overall network.

categories were to help generate names for network members, and they capture participant perception of the composition of their networks—for example, they might put a romantic partner in Family or Friends, or a coworker could be categorized in School/Work or in Friends.[3]

Figure 5.1. *Network distribution by category (N=34)*



Overall, at T1, 91% (n=31) respondents named at least one person they categorized as Family, 94% (n=32) categorized at least one person as a Friend, 74% (n=25) put someone in the School/Work category, and 79% (n=27) of the T1 respondents categorized at least one person in the Other category. Again, there may be fluidity between these categories and the compositional distribution of the personal networks

[3] Note that the Family category includes all the biological family members and most of the foster family members named in this study. At T1, all but two foster grandparents (parents of the foster parent) and one foster parent were categorized as Family. At T2, all foster family members were categorized as Family.

provides a snapshot of how respondents organized their support networks on that day. Additionally, the distinction of the core network members who regularly provide support alters the compositional distribution. For example, at both baseline and follow-up, participants most frequently named members in the Friends category, with Family a close second (see Table 5.1; T2 not shown). However, when respondents were asked to identify the core network members who provide them support at least once a month, they named more members categorized as Family than Friends, on average. Proportionally, Family and Friends made up 64% of the networks and 72% of the cores, and the number of networks including at least one member in the Family (91%) and the Friends (94%) categories is somewhat comparable to that found in a study of younger (16-19) homeless and runaway youth networks (80% name a parent or other family member, and 71% name a friend; Johnson et al., 2005).

To better describe the members providing regular support, respondents were asked for more specific role descriptions for each person in their core networks. Table 5.2 reports the roles most regularly included in the core networks, listed by whether these are generally considered formal or informal roles. Where possible, core-periphery comparisons are provided to illustrate cases in which there was enough information provided on the network map to determine whether these roles appeared in the network periphery (e.g. a participant could write “uncle” or just put initials). Note that this list does not include all role descriptions in the youth networks, but details how many networks included at least one of these particular roles of interest in their networks at the two time points.

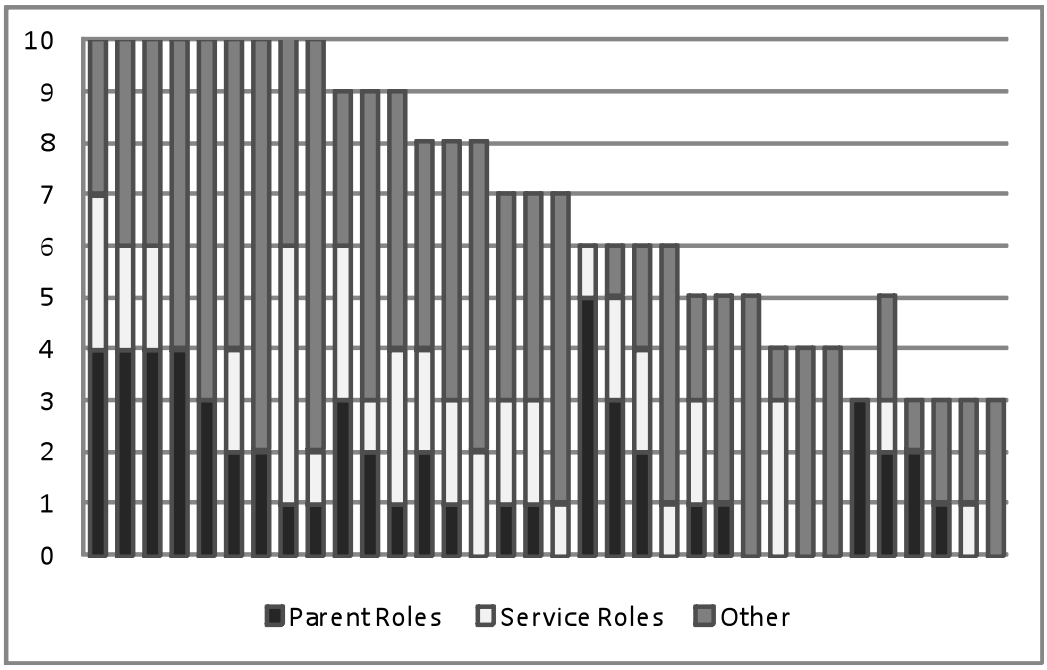
Table 5.2. *Prevalence of selected network roles*

		T1 (N=34)		T2 (N=27)	
		Core	*Periphery*[a]	*Core*	*Periphery*[a]
Formal Roles	Child welfare caseworker	11 (32%)	5 (15%)	5 (19%)	5 (19%)
	ILP case manager	13 (38%)	3 (9%)	6 (22%)	7 (26%)
	School-based advisor/teacher/coordinator/tutor	11 (32%)	5 (15%)	10 (37%)	3 (11%)
	Job-based coach/coordinator or boss/manager/supervisor	3 (9%)	1 (3%)	4 (15%)	-
	Current or former foster parent	12 (35%)	1 (3%)	4 (15%)	-
Informal roles	Mom/dad/stepfather/stepmother	13 (38%)	3 (9%)	16 (59%)	3 (11%)
	Grandparent	10 (29%)	1 (3%)	11 (41%)	3 (11%)
	Aunt/uncle/sibling/cousin	15 (44%)	2 (6%)	17 (63%)	10 (37%)
	Mentor (non-CCS)	3 (9%)	-	3 (11%)	-
	CCS mentor	0	0	7 (26%)	4 (15%)

[a]Underestimates roles in periphery, tie was not described in core at either T1 or T2.

To determine the distribution of two types of roles of interest, role descriptions for the core ties were designated as Parent roles—defined as mothers and fathers, step-parents, foster parents, grandparents, and aunts or uncles—and Service-oriented roles, defined as child welfare and ILP caseworkers, post-secondary teachers and staff, or any other paid service-providers. (Although arguably foster parents serve both a parental and service-providing function, they are designated as Parent roles in this study.) These role assignments were intended to capture subsets of core members presumed to provide multi-dimensional support as part of their formal or informal role in a young person's life, regardless of the broad compositional category participants selected for these members. Figure 5.2 summarizes the distribution of these roles in the cores at T1.

Figure 5.2. *Core network distribution by role*



As shown in Table 5.1 and Figure 5.2, cores include between one and two Parent roles and Service roles, on average, although more parent figures and fewer service providers are named at follow-up (not shown). Additionally, two child welfare-specific roles are expected to be included in many of the participant networks: ILP case managers providing transition services and/or state child welfare caseworkers ("ILP/CW"), if participants still have an open child welfare case (or if respondents indicate an ongoing supportive relationship with a former caseworker as a core tie). Table 5.3 reports the prevalence of these specific roles, along with the broadly-defined Parent and Service roles, and these role types in combination. The majority of participants have at least one parent figure at baseline, and about half have more than one, and this increased between the two network measurements. Over half of the participants name at least one service-provider at baseline, though fewer have more than one, and this decreases over time.

Table 5.3. *Prevalence of selected core network roles*

	T1 (N=34)	T2 (N=27)
At least one PARENT role	25 (74%)	22 (82%)
More than one PARENT role	16 (47%)	14 (52%)
At least one SERVICE role	23 (68%)	15 (56%)
More than one SERVICE role	16 (47%)	10 (37%)
At least one ILP/CW	13 (38%)	8 (30%)
At least one PARENT and SERVICE role	18 (53%)	13 (48%)
At least one PARENT and ILP/CW	10 (29%)	6 (22%)

At both measurements, an ILP case manager or a child welfare caseworker accounts for more than half of the service-providing roles in the core networks, which means that the remainder likely indicate the presence of a core service-oriented relationship with teachers or staff in a post-secondary program. About half have at least one parent and one service role at either time point, although about one-quarter of respondents name at least one parent role plus an ILP or child welfare service-provider. Rice and colleagues (2011) report similar findings with homeless and runaway youth of similar age, with 44% of their respondents naming a caseworker as someone they interact with, compared to the support networks reported here, where 38% of participants name an ILP or child welfare worker at T1 and 30% at T2. Further, 50% of the homeless and runaway respondents included a parent as someone they interact with, and in this sample, 38% named a parent (more narrowly defined as parents or step-parents) as a supportive core tie at T1 and 59% named a parent at T2 (see Table 5.3).

Relational Characteristics

Lastly, there is low variability in tie strength at baseline (M=2.21, SD=.255). On average, frequency of supportive contact was about weekly (1.0=*monthly*, 2.0=*weekly*,

3.0=*daily*) and frequency had the most variance (*M*=2.09, *SD*=.424), relationships were close (1.0=*not close*, 2.0=*close*, 3.0=*very close*) and closeness had the least variance (*M*=2.32, *SD*=.317), and tie duration was about 1-5 years (1.0=*less than a year*, 2.0=*1-5 years*, 3.0=*more than 5 years*).

Summary of Findings

- Youth name 11 support network members on average, with 7 members providing "core" monthly support, and the degree of density is similar to other studies with this age group.
- Core ties provide about half the support they could be providing. Emotional support is most common, followed by informational support, and lastly, concrete support.
- Almost all youth named at least one person in Family and Friends, and three-quarters named School/Work or Other network members. Family and Friends make up 64% of the networks and 72% of the cores, with Family providing more core support.
- Three-quarters of the networks include a Parent figure at T1, and about half have more than one, and this increased over time. Well over half of the networks include at least one service-provider at T1, and about half have more than one, and this decreased over time.
- Support is weekly on average, and relationships are close and have lasted 1-5 years.

Aim: Explore network variables by race/ethnicity and living situation.

The next aim uses analysis of variance to explore whether race/ethnicity or living situation are directly related to the primary network indicators (as listed in Table 5.1), both to test whether this methodology provides data that statistically varies by these predictors, and to determine whether any findings can be meaningfully interpreted in ways relevant to research and practice. First, Table 5.4 shows the three T1 network variables with statistically significant different means by race/ethnicity: network density and core density (variables are contingent upon each other), and network transitivity (somewhat contingent on network density). (See Appendix A – Table A.1 for all results.)

Youth who identified as Hispanic/Latino had higher network density compared to those categorized as Mixed/other, and the Hispanic/Latino group also had higher core density and network transitivity compared to all other groups. Note that the Hispanic/Latino group also had the most core members in Family and the most overall network members in Family and Friends (not statistically significant). On the other hand, this group had the fewest core Parent roles, likely indicating peer Family ties with siblings and/or cousins; such ties may be expected to be interconnected and also to have cross-category ties with Friends, which may explain the density and transitivity findings. Note that there were no statistically significant differences by race on the T2 variables (not reported).

Although the group differences are not statistically significant in this sample, there is also a notable disparity in the group means for core members in Parent roles and Service roles by race/ethnicity (as shown in Table 5.4). In both cases, White youth have

the highest means, naming nearly two core network members in each of these roles on average (although the Mixed/other group names the most core Parent roles on average). Participants identifying as Black/African-American name almost as many parents as White youth, but fewer service providers, which is similar to the Mixed/Other group, and lastly, the Hispanic/Latino group names the fewest of both.

Table 5.4. *Network variables by race/ethnicity*

T1 Variables	White	Black/AA	Hispanic/ Latino	Mixed/ Other	*p*
Network density[a]	.26	.23	$.51_4$	$.15_3$	**.042**
Core density[a]	$.29_3$	$.30_3$	$.67_{1,2,4}$	$.16_3$	**.019**
Transitivity[a]	$.03_3$	$.05_3$	$.20_{1,2,4}$	$.02_3$	**.030**
Core in PARENT roles[a]	1.78	1.57	.75	2.00	.484
Core in SERVICE roles[a]	1.72	1.29	.25	1.00	.121

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD post-hoc comparison; subscript numbers refer to the group columns in the order listed in the table.
[a]Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.

Next, Table 5.5 shows that T1 living situation was associated with statistically significant group differences on four of the primary T1 network variables (see Appendix A – Table A.2 for all results). First, participants who reported that they were living with foster family at T1 had more core network members and more network members overall than those that were living with biological family. There was also a group difference by support type, where youth living with foster family reported more total emotional support provided compared to those who were living alone. Additionally, there was one support domain associated with group differences by T1 living situation: youth living with foster family at T1 reported almost twice as much academic support as youth who were living with others.

Table 5.5. *Network variables by T1 living situation*

T1 Variables	Foster Family	Bio Family	Alone	With Others	*p*
Network size	12.87_2	6.00_1	9.60	9.70	**.007**
Core network size[a]	8.07_2	4.00_1	6.20	6.30	**.038**
Total emotional support	23.47_3	11.25	13.00_1	16.00	**.041**
Support in academic domain	16.33_4	10.00	9.60	8.30_1	**.016**

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD post-hoc comparison; subscript numbers refer to the group columns in the order listed in the table
[a]Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.

Lastly, Table 5.6 shows that the reported living situation at T2 was associated with statistically significant group mean differences on four of the primary network variables measured at T2 (see Appendix A – Table A.3 for all results). First, participants living with biological family at T2 had smaller networks compared to those living with foster family or with others, and youth living with foster family had larger cores and categorized more core ties as Family than those living with biological family or living alone. Note that this category includes any members participants categorized as "family" on the network map, regardless of whether these are biological, adoptive, or foster family members or kin; the finding that youth living with foster family at follow-up have larger networks or name more Family members may simply be due to foster family size or the potential for supportive connections to both foster and biological family members. Youth who were living alone at T2 also named fewer network members in the Family category, compared to those living with foster family or with others. Youth living with foster family at T2 also named more core members in Parent roles, compared to youth living alone, and reported over twice as much total emotional support compared to youth living with biological family.

Table 5.6. *Network variables by T2 living situation*

T2 Variables	Foster Family	Bio Family	Alone	With Others	*p*
Network size	15.75_{2}	$9.25_{1,4}$	10.43	16.13_{2}	**.019**
Core network size[a]	$9.50_{2,3}$	5.50_{1}	5.71_{1}	8.13	**.009**
Network in FAMILY	5.13_{3}	2.75	$2.57_{1,4}$	5.13_{3}	**.008**
Core in FAMILY	$4.25_{2,3}$	2.50_{1}	1.57_{1}	3.00	**.008**
Core in PARENT roles[a]	2.75_{3}	1.75	$.71_{1}$	1.38	**.039**
Total emotional support	30.38_{2}	14.00_{1}	18.86	26.00	**.013**

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD post-hoc comparison.
[a]Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.

Summary of Findings

- Hispanic/Latino youth have more interconnected networks.
- White youth name the most Parent and Service roles, African-American and Mixed/other youth name as many parents but fewer service providers, and Hispanic/Latino youth name the fewest of both these roles.
- Youth living with foster family name more network members, and more core ties—particularly ties categorized as Parent figures and Family—in comparison to other groups, especially at follow-up. Participants living with foster family also report more emotional and academic support in comparison to other groups at both time points.

Aim: Explore youth support networks by correlational patterns of structure, composition, relational characteristics, and support content.

Before moving on to analysis designed to detect changes in these networks over time, it is important to determine whether conceptual aspects of the networks "hang together" in expected ways, based on the network and social support literature (e.g. density is expected to have a negative relationship with size and a positive relationship with tie strength). Further, there is an exploratory interest in unexpected findings that may be associated with the experiences of this population (e.g. considering whether the presence of family members in the network is associated with types of support provided, and distinguishing whether these are likely parent figures, compared to peer ties between siblings or cousins). To begin to assess any correlational patterns in these networks, bivariate analysis was conducted using all the primary network variables from Table 5.1. Next, cluster analysis was used to create network "profiles" based on correlation of the network indicators, in an attempt to predict patterns of support provision.

Bivariate Analysis of the T1 Variables

First, bivariate analysis was conducted to explore correlations between primary indicators of network structure and composition, relational characteristics, and support provision. See Appendix A–Table A.4 for all bivariate associations and note the selection criteria for reporting; many network variables are expected to reflect aspects of the same underlying network property (e.g. core density and network density) and these associations are not reported. Also note that given the number of variables analyzed here, there is an increased risk for Type 1 error.

There are a few associations of interest from the bivariate analysis. First, there are expected relationships between indicators of support capacity and interconnectedness. Network size is negatively correlated with density (-.403*), which is expected, and network and core size are correlated with support provision by total (.528** and .539**, respectively), as well as by type and by domain. This is expected, given that core size determines the total support measurable by this instrument, and overall network size limits how many members might be in the core.

Additionally, there are expected correlations between tie characteristics and network structure, in terms of density and transitivity (which is itself contingent on density, as measured here); denser and more transitive networks have cores with stronger ties that are closer and longer-lasting (for example, the largest correlation, .621**, is between core density and average tie duration), and this relationship between interconnection and tie strength is expected (e.g. Degenne & Lebeaux, 2005; Walker, et al. 1993). Further, tie characteristics are associated with core supportiveness, where stronger ties, overall and in terms of frequency and closeness, provide more support per tie overall or by type (for example, the correlation between average tie strength and support per tie is .512*); again, this is an expected finding (Walker, et al., 1993) and confirms that such patterns are observable in this sample with this network instrument.

There are also associations specific to compositional indicators used here. In general, having more members classified as Family (by total or by proportion) is correlated with longer-lasting ties as expected (e.g., .644**), but the number of Parent roles is specifically correlated with total support (.393*); this may be due to the

association between the number of Parents and core size (.455**)**,** but it may be that Parent roles provide more support, as explored in Research Question II. Comparatively, Service role indicators (specifically, and as members of the SWO category) are associated with networks with less density (e.g., -.375*), shorter average tie duration (-.508*), and weaker ties overall (e.g., -.371*), and there is no relationship between Service roles or SWO and support, with the exception of academic support (.474*) (although there is a similar correlation between members in Parent roles and academic support, so again, this may be a reflect of core size). Lastly, specific to how composition was measured here, there is an expected relationship between size and diversity in the network (.442*) and the core (.414*).

Cluster Analysis of T1 Variables

Determining cluster assignments. Next, a cluster analysis was conducted using structural, compositional, and relational indicators to create youth network "profiles" that could distinguish patterns of support provision. The bivariate associations reported above guided the selection of the T1 variables that were included in the cluster analysis, and multiple combinations of variables were run in an exploratory effort to identify a cluster analysis "solution" that provided distinct and interpretable clusters of reasonable size for the purpose of conceptual description. Table 5.7 shows the T1 variables used to create the final cluster solution selected for further analysis, with the group mean differences reported by cluster assignment group; in other words, each row shows the average value for all the participant networks that were assigned to that cluster group based on similarity.

Table 5.7. *Clustering variables and cluster group means*

T1 Clustering Variable	Cluster A (n=5)	Cluster B (n=6)	Cluster C (n=14)	Cluster D (n=8)	*p*
Network size[b]	$8.00_{2,3}$	$16.00_{1,3,4}$	$12.00_{1,2,4}$	$6.25_{2,3}$	**.000**
Core size [a,b]	$3.67_{2,3}$	$9.83_{1,3,4}$	$8.07_{1,2,4}$	$4.63_{2,3}$	**.000**
Core density [a]	.49	.29	.23	.35	.188
Transitivity [a,b]	.10	.03	.02	.08	.232
Network diversity [a]	3.33	3.50	3.64	2.88	.116
Core diversity [a]	2.00_{3}	2.67	3.43_{1}	2.63	**.007**
Number of FAMILY in core [a]	2.17_{2}	$5.50_{1,3,4}$	2.07_{2}	$.88_{2}$	**.000**
Number of FRIENDS in core [a]	$.67_{2,3}$	3.17_{1}	2.86	2.25	**.022**
Number of SWO in core [a]	$.83_{3}$	1.00_{3}	$3.00_{1,2,4}$	1.38_{3}	**.004**
Core members in Parent roles [a]	2.00_{4}	$3.17_{3,4}$	$1.64_{2,4}$	$.25_{1,2,3}$	**.001**
Core members in Service roles [a]	$.33_{3}$	1.00	2.14	1.00	**.007**
Tie frequency [a]	2.05	1.93	2.12	2.19	.897
Tie closeness [a]	2.32	2.37	2.27	2.36	.928
Tie duration [a]	2.45	2.38	2.18	2.13	.404

Note. In k-means cluster analysis, the F-test indicates which variables distinguish the clusters for descriptive purposes and does not necessarily test the null hypothesis that the cluster means are equal. In this case, follow-up ANOVA of the clusters matched the F-test and p-values given in the cluster analysis. Means with different subscripts differ at $p < .05$ in the Tukey HSD or Games-Howell post-hoc comparison, depending on equality of variance. Subscript numbers refer to the group columns in the order in which they appear in the table.

[a]Variable is not normally distributed. The reported p-value is for the nonparametric Kruskal-Wallis H test of group differences.

[b] Group means are also different at T2 ($p < .05$) along a similar pattern, with values for clusters A and D ranked lowest and values for B and C ranked highest.

In this 4-cluster solution, networks are primarily grouped by size and composition, rather than relational characteristics or structural properties like density (see Figure 5.3 for illustration of the mean differences on the distinguishing variables). This

solution was selected for a number of reasons. First, it had the most clustering variables distinguishing the groups, and these variables were conceptually related (size variables and compositional indicators); in other solutions, groups were distinguished by fewer variables, which limits cluster description. Further there were two conceptually similar "sets" of variables that did not distinguish the clusters; generally, neither the structural indicators of interconnectedness or the relational indicators were useful for distinguishing clusters, and these indicators were also not useful for distinguishing groups in analyses of variance elsewhere in this study. Next, this solution was selected because the sizes of each cluster were relatively balanced compared to other solutions. Lastly, these clusters were most clearly associated with total support provision by type and domain. To illustrate why this solution was selected, consider a comparable 3-cluster solution which resulted in two higher-support groups and one lower-support group; adding a fourth cluster delineates this lower-support group by compositional diversity and specific roles of interest (e.g. the presence of Parent or Service roles), providing more interpretable "profiles" in terms of network composition and support provision.

Using the clusters to predict support. The final cluster assignments predicted patterns in T1 support provision as reported in Table 5.8. Overall, the clusters distinguished support provision in total, and by every support type and domain, with consistent group comparisons. In summary, for every variable reflecting total support provision, Cluster B has the highest total support, followed by Cluster C, and Clusters A and D have the lowest support. The clusters were not significantly related to the degree of support indicators, which control for core size, in this sample.

Table 5.8. *Support provision by cluster*

T1 support variables	Cluster A	Cluster B	Cluster C	Cluster D	*p*
Total support provided (0-120)[a,b]	32.17_{2}	$68.00_{1,4}$	50.57_{4}	$28.13_{2,3}$	**.017**
Emotional support (0-40)[b]	$10.17_{2,3}$	$27.33_{1,4}$	$21.36_{1,4}$	$12.25_{2,3}$	**.002**
Info. support (0-40)[b]	$8.67_{2,3}$	$23.50_{1,4}$	$16.71_{1,4}$	$9.00_{2,3}$	**.003**
Concrete support (0-40)[a]	9.33	17.33	12.50	6.88	**.012**
Academic domain (0-30)	8.00_{3}	15.67	$15.29_{1,4}$	7.50_{3}	**.012**
Career domain (0-30)[a]	$5.67_{2,3}$	$16.33_{1,4}$	$11.86_{1,4}$	$6.25_{2,3}$	**.009**
Degree of support from core (0-1.0)	.61	.58	.51	.52	.803
Degree emotional support[a]	.66	.70	.65	.56	.697
Degree informational support	.55	.60	.50	.51	.874
Degree concrete support[a]	.61	.44	.39	.36	.571
Degree academic support	.71	.53	.53	.58	.654
Degree career support	.57	.55	.48	.46	.771
Mean support per tie (0-12)	7.53	7.03	6.33	6.25	.787

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD comparison. Subscript numbers refer to the group columns in the order in which they appear in the table.

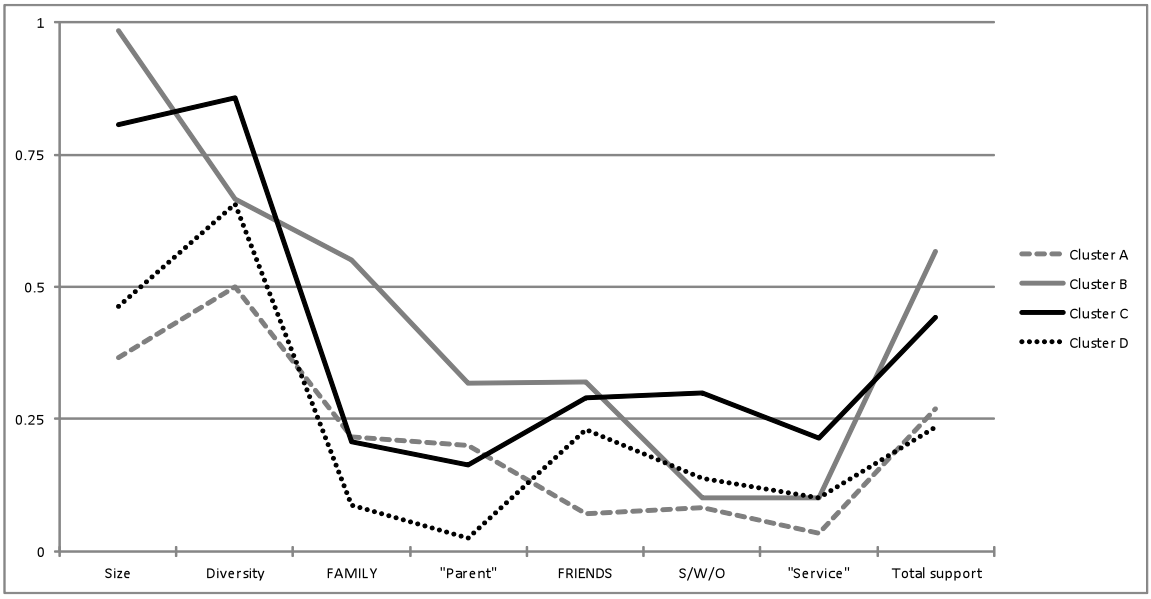
[a] Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.

[b] Group means are also significantly different at T2 ($p < .05$), with values for clusters A and D ranked lowest and clusters B and C ranked highest.

The consistent associations between the cluster groups and the total support variables (Table 5.8) may be attributable to the network and core size variables distinguishing the clusters, as having a larger network is associated with having more people in the core providing monthly support, and the more core members included on the network grid, the greater the support capacity measurable using this network instrument. However, increased core capacity may not translate to more total support in

all cases, and it is these kinds of distinctions this analysis attempted to parse. For example, a smaller core may have more support provided per tie, compared to a larger core with lower support per tie, resulting in more total support from the smaller core. Additionally, although core network size is expected to be correlated with total support, the size variables provided enough variability to split the small sample; in other words, attempts to exclude the size variables or recode size as proportional (e.g. actual versus potential core size) did not distinguish groups well. The size variables split the networks into clusters more evenly and meaningfully for interpretation. See Figure 5.3 for illustration of cluster mean differences.

Figure 5.3. *Cluster means on distinguishing variables (p <.05)*



Note. Size, diversity, and compositional means are for the core network. All variables are coded as proportions.

Network visualizations for each cluster. Another way to illustrate differences between the clusters is through network visualization showing representative patterns of supportive ties. In Figures 5.4–5.7, these representative networks are illustrated with attention to the clustering variables.[4] In each of these, nodes representing the core ties are indicated by specific role descriptions (in caps) and line thickness indicating the tie strength; peripheral ties are labeled by category, if no more specific role is discernible. Positioning reflects how the categories are arranged on the network map: the upper-left is Family, upper-right is Friends, lower-left is School/Work, and lower-right is Other. Note that network density and transitivity are also illustrated, although these were not distinguishing clustering variables. Each representative network visualization is followed by a summary of the cluster group means, which are also loosely described in terms of common indicators of bonding and bridging social capital; in this study, social capital is used descriptively and is not specifically measured.

Cluster A: *Bonding, not bridging*. This low-support cluster (15% of sample) is notable for having as many core family ties on average as found in high-support Cluster C, but the lowest categorical diversity in the core, the fewest core ties from the School/Work/Other category, the fewest core members in service-providing roles, and the fewest Friends in the core. On the other hand, this cluster has the highest degree of interconnection (core density) and network transitivity (cross-category ties, not seen in Figure 5.4), although these are not statistically significant clustering variables. These features can be summarized as suggesting the presence of some bonding capital, in that

[4] The clustering procedure reports the "distance" of each case from the cluster group means. Note that the case closest to each cluster was selected for visualization, and may not show all of the features associated with the cluster.

there are strong Family and Parent ties in a dense family-oriented core, but low bridging capital, in that the small core is the least diverse of the clusters (with few additional ties or diversity in the periphery), and there is little connection to School/Work/Other or service-providing ties. This combination of higher-bonding and lower-bridging capital is associated with the most support per tie (although this is not a statistically significant variable), but the second lowest total support overall, and more specifically, the lowest total emotional and information support at both baseline and follow-up (Table 5.9).

Figure 5.4. *Cluster A network visualization*

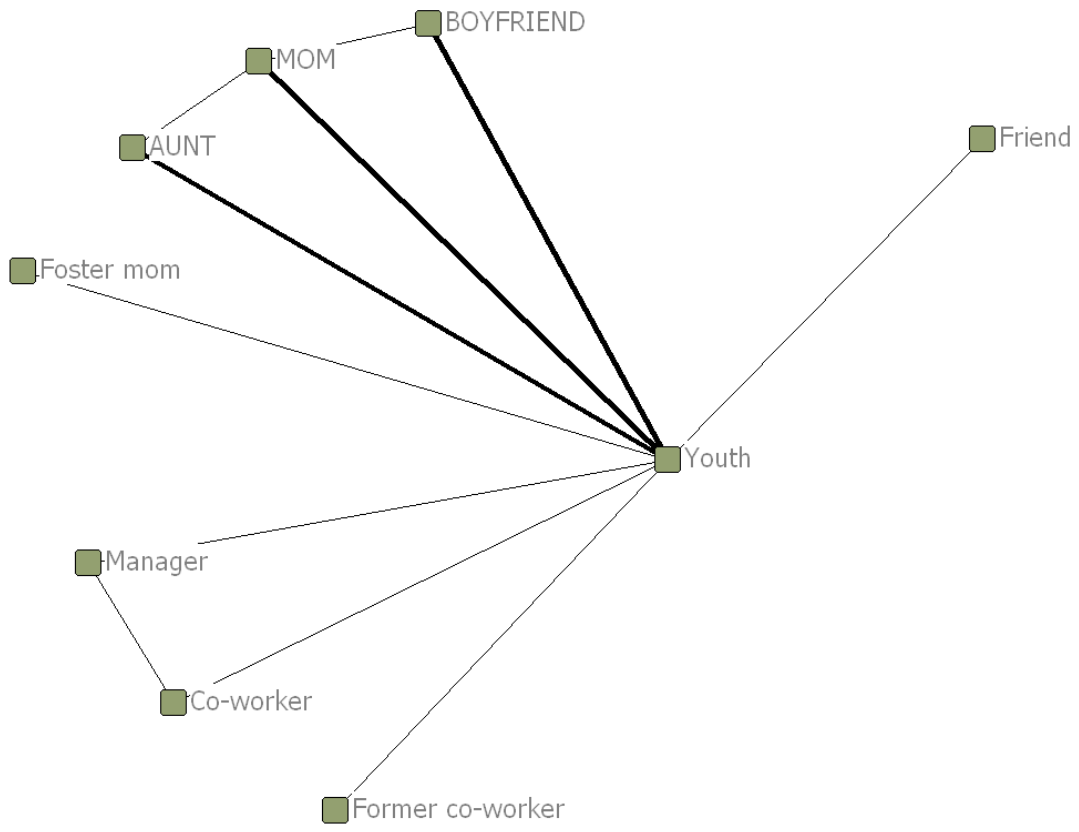
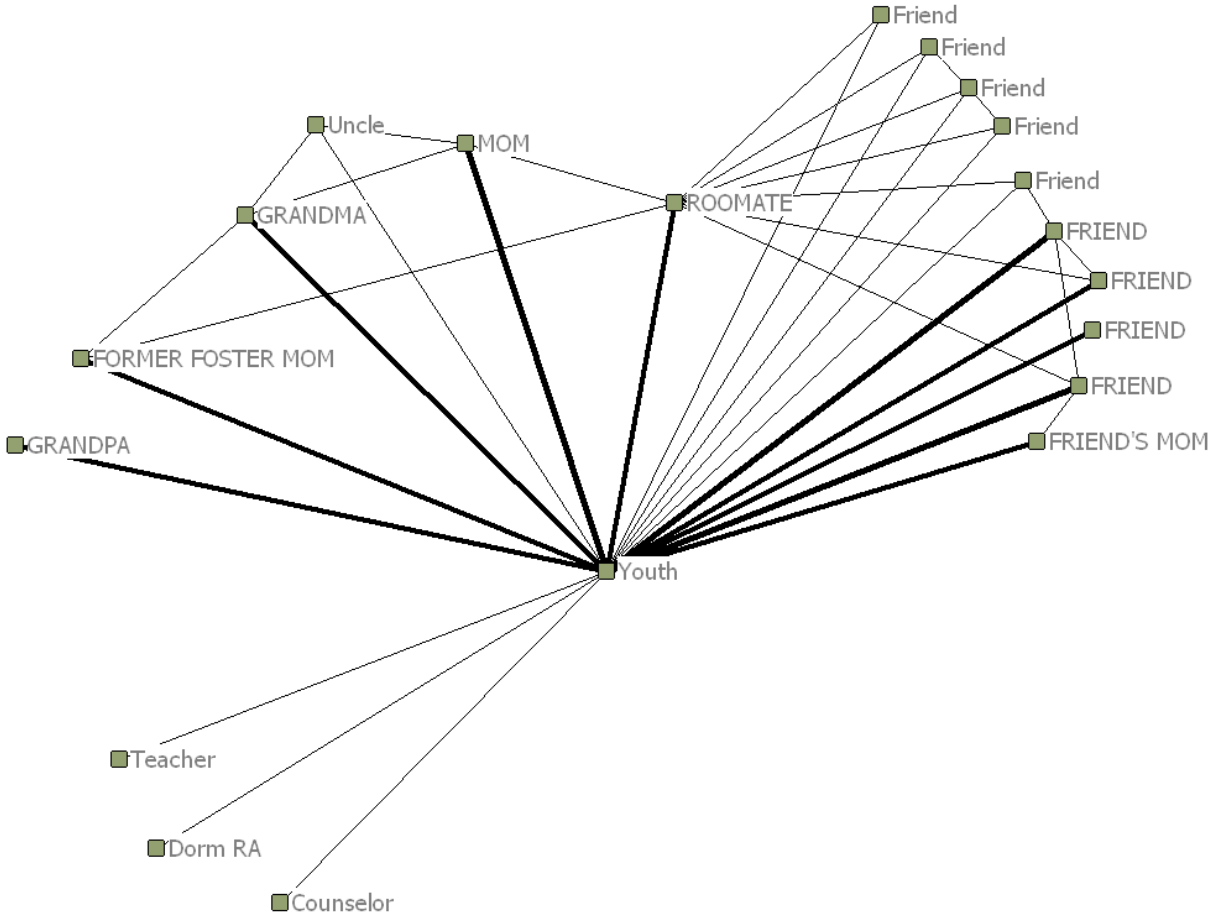


Figure 5.5. *Cluster B network visualization*



Cluster B: ***More bonding than bridging.*** Alternatively, high-support Cluster B (18% of sample) has some of the potential indicators of bonding capital seen in Cluster A, including the most Family, Parent, and Friend ties in the core (as seen in Figure 5.5), and high support per tie (not statistically significant), but also has multiple indicators of bridging social capital, comparable to the service-oriented Cluster D. For example, participants in this cluster have the largest networks and cores on average and have the second-highest degree of diversity, plus one core tie, on average, from the SWO category

in a service-providing role (not seen in Figure 5.5). Compared to Cluster A, these cores also have lower density, although as seen in the illustration, this lower density is a function of the larger network overall and does not indicate a lack of interconnection between network members. These combined characteristics—bonding capital plus some weak ties and overall compositional diversity—are associated with high support-per-tie, but also the most total support (and by each type and domain) compared to the other clusters at both T1 and T2.

Cluster C: ***More bridging than bonding***. This cluster (41% of sample) has about the same number of Family and Parent ties as the bonding-oriented low-support cluster A, but also has the most additional school- and work-oriented ties, and the most service-providing ties, compared to the other clusters, plus the second-highest number of friends in the core (as seen in Figure 5.6). This increased compositional diversity is associated with lower core density, as seen with Cluster B, and although total support provided is second only to Cluster B, the inclusion of non-family ties lowers average support per tie overall. As reported in Table 5.10, these participants are more likely to be living with foster family at T2 than expected (remembering that the Family ties and Parent roles could be foster or biological family members), and they are specifically not likely to be living independently on their own or with peers at T2. Cluster C also has the second largest network and core size, and these features combined—bridging capital available through compositional diversity, plus a large core with some strong non-family ties—contribute to this cluster being associated with the second-highest total support, at both T1 and T2.

Figure 5.6. *Cluster C network visualization*

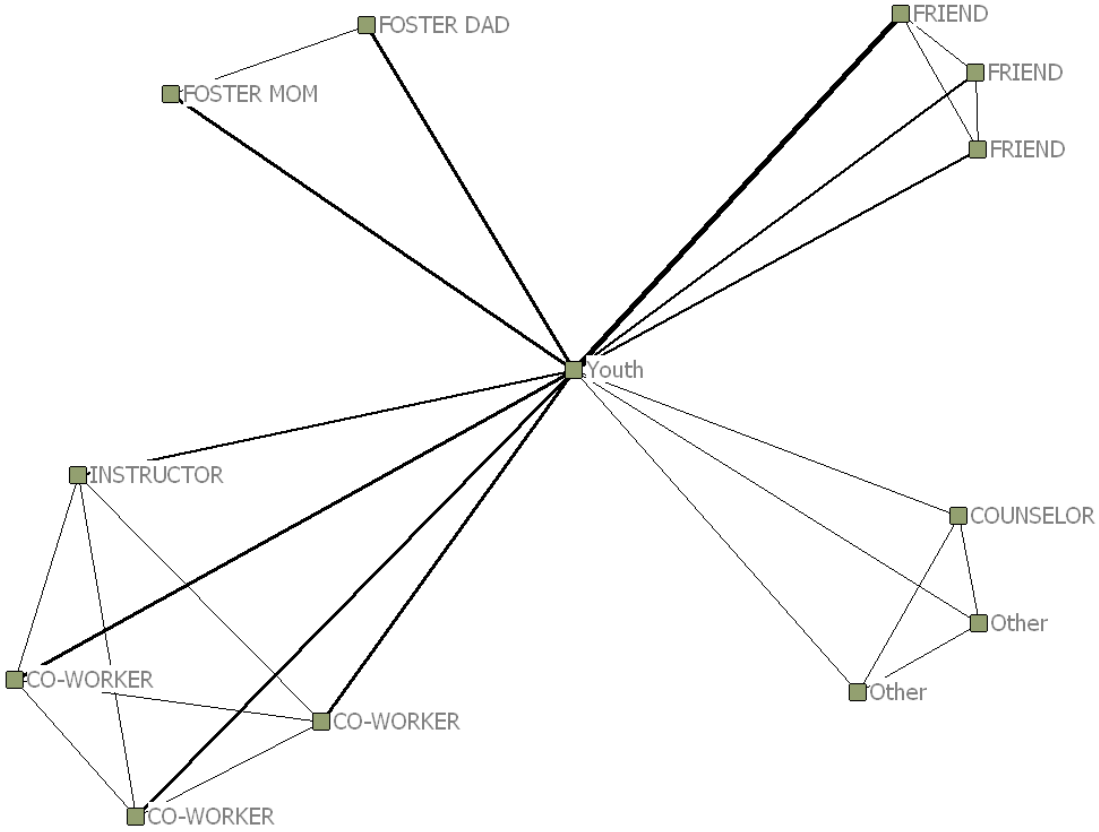
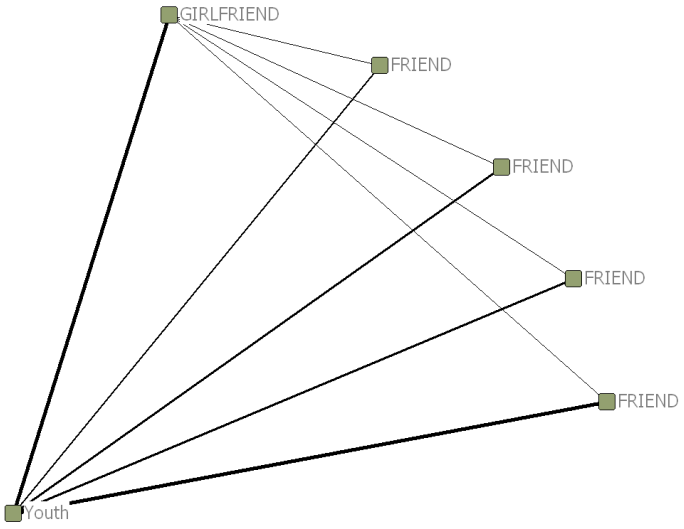


Figure 5.7. *Cluster D network visualization*



Cluster D: *Bridging, not bonding*. Lastly, Cluster D (26% of sample) is most similar to Cluster A in size and structure, but with very different composition. Like Cluster B, Cluster D has some representation of school- and work-oriented ties and service-providing roles, but this cluster also has the lowest average number of core ties categorized as Family or presumed to be in a Parent role. The network visualization for Cluster D illustrates a Friend-reliant version of this structure, which may still provide some cohesion (this cluster has the second highest density and transitivity), but provides the lowest support per tie, and due to the small core size, the lowest total support at both T1 and T2. As seen in Table 5.10, this group is likely living independently at T2, and not with biological or foster family members.

Cluster assignment by race/ethnicity and living situation. Table 5.9 shows the cluster distribution by race/ethnicity and living situation. Only T2 living situation was significant (x^2=18.472, p=.030), with more Cluster C participants living with foster or biological family than expected at T2 (62% of youth living with foster family at T2, and 50% of youth living with biological family at T2, were in Cluster C at T1), and fewer than expected living alone or with others at T2. On the other hand, youth in Cluster D are more likely to live alone (71% of youth living alone at T2 are in Cluster D), and none of them live with foster or biological family at T2. Further exploratory analysis of the clusters by living situation shows a significant difference in the clusters (x^2 = 10.888, p=.012) by whether participants changed how they reported their living situation between T1 and T2 (see the sample descriptives reported in Table 4.1). Of the 10 living situation transitions reported at T2 (37% of n=27 participants), 60% of these were in the lowest-

support Cluster D at T1 (86% of n=7 changed living situations), 20% were in low-support Cluster A (40% of n=5), one (10%) was in highest-support Cluster B (20% of n=5), and one (10%) was in high-support Cluster C (14% of n=7).

Table 5.9. *Cluster distribution by race/ethnicity and living situation*

T1	***n***	**White**	**Black/ AA**	**Hisp./ Lat.**	**Mixed/ other**	**Foster family**	**Bio. family**	**Alone**	**With others**
A	6	2 (33%)	-	2 (33%)	2 (33%)	1 (17%)	2 (33%)	1 (17%)	2 (33%)
B	6	2 (33%)	2 (33%)	1 (17%)	1 (17%)	4 (67%)	-	-	2 (33%)
C	14	10 (71%)	3 (21%)	1 (7%)	1 (7%)	9 (64%)	1 (7%)	2 (14%)	2 (14%)
D	8	4 (50%)	2 (25%)	1 (13%)	1 (13%)	1 (13%)	1 (13%)	2 (25%)	4 (50%)
T2	***n***	**White**	**Black/ AA**	**Hisp./ Lat.**	**Mixed/ other**	**Foster family**	**Bio. family**	**Alone**	**With others**
A	5	1 (20%)	-	2 (40%)	2 (40%)	1 (20%)	2 (40%)	1 (20%)	1 (20%)
B	5	1 (20%)	2 (40%)	2 (40%)	1 (20%)	2 (40%)	-	-	3 (60%)
C	10	7 (70%)	3 (30%)	-	-	5 (50%)	2 (20%)	1 (10%)	2 (20%)
D	7	3 (43%)	2 (29%)	1 (14%)	1 (14%)	-	-	5 (71%)	2 (29%)

Note. There are no statistically significant differences in cluster distribution at T1 by race ($x^2 = 9.726$, p=.373), by living situation ($x^2 = 11.937$, p=.217), or T2 retention ($x^2 = .979$, p=.806). There are no statistically significant differences in cluster distribution at T2 by race ($x^2 = 12.008$, p=..213). There is a difference in cluster distribution by T2 living situation ($x^2 = 18.472$, p=.030).

Research Question II: How does youth network form and content change over time?

Aim: Describe network-level change and membership stability over time.

Network-level Change Over Time

The first analysis exploring network change compares the values for the baseline and follow-up measurement of each network variable to assess: (1) whether these are correlated, indicating some reliability of measurement between the two time points, and (2) whether there is a statistically significant difference in the values reported at the two time points, indicating that networks changed over time. If the T1 and T2 network variables are both correlated over time and show differences in the values over time, there can be some preliminary assumption of reliable measurement of network change.

First, medium and large correlations ($p < .05$) between the T1 and T2 measurements indicate reliability on most (64%) of the network variables (Table 5.10), and this will be discussed in further detail in the findings for Research Question III. Second, parametric paired-samples t-tests and non-parametric related-sample comparisons indicate some within-group differences over time in network structure, composition, relational characteristics, and support provision (Table 5.10). Generally, results indicate that reported network size, tie strength, and degree of support provision from core ties all showed statistically significant increases over time ($p<.05$). Total support provided also increased over time at trend level ($p<.10$).[5]

[5] As an analytical aside, note that Table 5.10 shows that in many cases, the T1 and T2 variables have a statistically significant correlation—which may indicate measurement reliability—but there is no change over time. On the other hand, for degree of total support, change over time is statistically significant, but the two measurements are not correlated; this variable may not be reliable, and this may also be an example of Type I error, given the number of variables compared.

Table 5.10. *Comparing networks over time (n=27)*

Network Variable	T1 *M*(*SD*)	T2 *M*(*SD*)	Correlation	*t* or *z*
Network size	10.59 (4.116)	13.52 (5.102)	**.558****	**3.440****
Core network size	6.74 (2.697)[a]	7.52 (2.548)[a]	**.767****	**2.135***
Network density	.28 (.200)[a]	.24 (.133)[a]	.366	1.009
Core density	.33 (.221)[a]	.36 (.213)	**.613****	.559
Transitivity	.06 (.093)[a]	.03 (.006)[a]	.325	1.204
Network diversity	3.44 (.506)[a]	3.5 (.643)[a]	.314	.577
Network members in FAMILY	2.81 (2.076)[a]	4.11 (1.987)	**.568****	**3.155****
Network members in FRIENDS	3.67 (1.881)	4.63 (3.053)	**.601***	2.050†
Network members in SWO	4.15 (2.597)[a]	4.78 (2.293)	.138	.926
Core diversity	2.89 (.801)[a]	2.81 (921)[a]	.329	.456
Core members in FAMILY	2.48 (1.949)[a]	2.93 (1.639)[a]	**.560****	1.521
Core members in FRIENDS	2.26 (1.509)[a]	2.41 (1.907)[a]	.362	.399
Core members in SWO	1.96 (1.480)	2.15 (1.812)[a]	**.465***	.758
Parent roles in core	1.63 (1.573)[a]	1.67 (1.387)[a]	**.700****	.332
Service roles in core	1.41 (1.390)[a]	1.19 (1.360)[a]	**.510****	1.181
Tie strength	2.23 (.245)	2.34 (.281)	**.495****	**2.205***
Tie frequency	2.06 (.452)[a]	2.20 (.409)	**.616****	**1.767†**
Tie closeness	2.35 (.287)[a]	2.46 (.367)	.131	1.587
Tie duration	2.29 (.386)	2.34 (.401)	**.446***	.728
Support per tie	6.73 (2.632)	7.50 (2.514)	**.440***	1.478
Total support (0-120)	46.70 (26.716)[a]	57.59 (27.740)	**.471***	**1.838†**
Emotional support (0-40)	18.44 (10.478)	23.67 (9.907)	**.676****	**3.301****
Informational support (0-40)	14.85 (9.388)	18.11 (10.375)	**.639****	2.005†
Concrete support (0-40)	12.56 (8.482)	15.74 (10.006)	**.557****	1.880†
Academic domain (0-30)	12.59 (7.702)	14.48 (7.723)	**.594****	1.413
Career domain (0-30)	10.37 (6.929)	12.30 (7.970)	**.620****	1.525

(Table is continued on next page)

Network Variable	T1 *M*(*SD*)	T2 *M*(*SD*)	Correlation	*t* or *z*
Degree support from core (0-1)	.55 (.210)	.65 (.216)	.367	**2.240***
Degree of emotional support	.62 (.291)[a]	.79 (.190)[a]	**.549****	**3.137****
Degree of info. support	.52 (.239)	.61 (.264)	.257	1.530
Degree of concrete support	.45 (.253)[a]	.54 (.298)	.350	1.510
Degree of academic support	.57 (.30)	.66 (.252)	.284	1.342
Degree of career support	.50 (.232)	.56 (.294)	**.473***	1.270

[a]Not normally distributed. Correlation is Spearman's rho. P-value is for the non-parametric Wilcoxon Signed Rank test (Z).

*p<.05. **p < .01. † p<.10.

Gain scores are reported in Appendix A – Table A.5 to summarize change in the network indicators between baseline and follow-up. These were calculated by subtracting the T1 values from the T2 values for each variable (with the exception of the ratio of T2 to T1 network size, which was calculated to report the expansion or contraction of the networks). As seen in the paired-samples comparisons, the overall trend in the gain scores is an increase in network size measures, relational characteristics, and both total support and degree of support provision, and these are statistically significant gains where indicated in Table 5.10. The T2 networks include 3 more members on average, and the size ratio indicates a 41% expansion over time, with slight decreases in network density and transitivity. Core size increased by less than one member, with relatively stable core density. There are increases in the mean number of network or core members within all compositional categories, and there is a small increase in Parent roles. There is a decrease in Service roles, which may explain the decrease in core diversity. Overall, the core ties in these networks are getting stronger and providing 10% more support at follow-up, with the most notable increase in emotional support provided per tie.

Membership Stability Over Time

For each of the 27 participants who completed the network measurement at both time points, the individual T1 and T2 core ties can be aggregated and analyzed by member name and role description to determine which ties were stable over time and which ties appeared or disappeared between the two network measurements (as in Morgan, et al., 1996). To do this for each participant, each unique core tie was coded as representing a person who was named at T1 only, or named at T2 only, or named at both time points. Table 5.11 reports the mean participant-level distribution of unique core ties (n=280) by tie-level stability; on average, participants named about three people at T1 that were not named at T2, three to four people were named for the first time at T2, and about four people were named at both measurements.

Table 5.11. Membership stability (N=27)

	M	***SD***	**Min.**	**Max.**
Core ties named at T1 only	2.89	1.948	0	6
Core ties named at T2 only	3.63	1.668	0	7
Stable core ties (named at T1 and T2)	3.93	2.074	1	8
Total core ties	10.33	3.541	3	16
Core stability (stable ties by total ties)[a]	.389	.118	.13	.89

[a]Variable is not normally distributed.

On average, participants retained about 40% of their core members from one time point to the next, and more ties were added at T2 than were lost, which explains the average gain in core size over time. Note that respondents may include a particular person on the network map at both measurements, but only include that tie in the core

network once. This analysis does not include information about whether, for example, a T1-only core tie was named in the network periphery at T2 (or vice versa), because there is not enough information provided on the network map to compare the network ties to a core tie that appears only once (specifically a role description to distinguish between multiple network members with similar initials). Member stability in this case only accounts for whether members were named in the core network at one or both measurements. (Reliability of these variables is further discussed in the findings for Research Question III.)

Summary of Findings

- The overall trend is a statistically significant increase in network size measures, tie strength, and both total support and degree of support provision.
- Follow-up networks include 3 more members on average (a 41% expansion over time), and cores increase by less than one member. There are increases for all compositional categories, and a small increase in Parent roles. There is a decrease in Service roles.
- Core ties are getting stronger and providing 10% more support at T2, with the most notable increase in emotional support provided per tie.
- Participants named about three people at T1 that were not named at T2, an average of three to four people were named for the first time at T2, and about four people were named at both measurements. 40% of core members were stable over time.

Bivariate Analysis of Network-level Change and Membership Stability

For the same reasons it would be expected that network-level structural, compositional, and relational indicators would have some correlation, and well as some association with support provision, it is also expected that there would be some correlation between the gain score versions of these variables, reflecting how these network aspects may change together over time. Additionally, there may be patterns in network-level change over time and core membership stability. Bivariate correlations were run using the gain scores to explore these associations, as reported in Appendix A - Table A.6. As with the T1 correlations reported as part of Research Question I, many of these gain scores are expected to be statistically associated (e.g. gains in the number of core family members and gains in core size) and these are not reported. Also note that given the number of variables analyzed here, there is an increased risk for Type 1 error.

There are a few statistically significant ($p < .05$) associations between the gain scores that echo the bivariate findings at T1. First, there is a large negative association between gains in size and density; as networks get larger, density decreases (-.639**), and vice versa, which is an expected network finding. Total emotional support moderately increases with network size (.430*), but informational support per tie moderately decreases (-.406*). Increased average closeness and duration of core ties is negatively associated with gains in network size (-.448* and -.607*), but positively associated with support per tie (.490** and .483*), and the strongest association is with concrete support provided per tie (*.548* and .513*). In other words, cores with closer or longer-lasting ties at follow-up are also more supportive, especially in terms of concrete

support. This is an expected finding (e.g. Wellman & Wortley, 1990), particularly if more biological family members are named as core ties at T2. Increasing closeness is also associated with increasing network density (.393*), but tie duration and overall strength are moderately associated with decreases in network diversity (-.446* and -.477*).

There are also a number of associations with the core membership stability indicators. The number of ties that are lost between measures (T1-only ties) has a large negative relationship with change in core network size (-.670**), indicating that in some networks these T1-only ties are not being fully replaced by new T2 ties. The number of T1-only ties is also associated with decreases in all support totals (e.g., -.425* for overall support); again, total support is a function of core size, and this may indicate that these T1-only ties are not being replaced in some cases, or are not being replaced by new ties providing the same level of support.

Next, the number of ties added at T2 is moderately associated with increased network and core size (.528* and .421**), but decreased transitivity (-.396*), tie closeness (-.422*) and tie duration (-.551**). On the other hand, there are, with the exception of emotional support, medium to large decreases in total support per tie (-.574*) and by type or domain. In other words, adding more new core ties at T2 "dilutes" the average support per tie (alternatively, adding fewer ties at T2 could indicate a stable network that is increasing support per tie).

Lastly, core stability (the percent of all unique core ties that are named at both time points) is associated with increasing relationship closeness (.385*), duration (.390*), and strength (.452*); whether cores are large or small, those with proportionally more

stable ties increase in average tie strength over time (factoring in potentially higher ratings for duration when these stable ties are measured a second time at follow-up). Alternatively, ties that get stronger over time are more likely to be named at both time points. Core stability is also associated with increases in average support per tie (.556*), and specifically concrete (.505**) and career support per tie (.383*), and increases in total informational (.401*), concrete (.514**), and career (.385**) support provided.

Aim: **Explore network-level change and membership stability by individual-level predictors.**

This aim explores whether the individual-level predictors of interest—participant race/ethnicity and living situation, and additionally, which of the cluster profiles describes the participant baseline network—distinguish how networks change over time, as indicated by the gain scores and membership stability variables. This aim is designed to test the methodological usefulness of the gain scores and membership stability variables, as well as to explore whether any findings are meaningfully interpretable in terms of how youth support networks may change differently over time within the different race and living situation categories, or by the descriptive cluster profiles.

Network-level Change by Individual-level Predictors

First, analysis of variance of the gain scores was conducted to explore change in the primary network variables by race and living situation.[6] Table 5.12 shows the two gain scores with statistically significant differences in group means by race/ethnicity category: core density and network transitivity (which are related aspects of network

[6] Note that repeated-measures ANOVA was also used to test within-subject and between-subject effects over time. These analyses did not show any interaction effects of time with these predictors, although the within-subject effect of time was confirmed (as reported in Table 5.10).

structure). (See Appendix A – Table A.7 for all results.) Core density decreased for the Hispanic/Latino group compared to all others, and transitivity decreased for the Hispanic/Latino group compared to White or Mixed/Other. Both these variables were higher for the Hispanic/Latino group at T1, which may explain the decrease compared to other groups. Additionally, there were statistically significant differences in the change in core diversity by race/ethnicity, such that diversity decreased for Black/African-American participants by .71, which was different that the Mixed/Other group, which gained a category (1.0) over time. Lastly, there were non-parametric group differences in the change in degree of concrete support, where concrete support per tie increased in the White and Mixed/Other groups and decreased in the Black and Hispanic/Latino groups, although parametric post-hoc tests did not specify which groups had statistically significant mean differences ($p<.05$).

Table 5.12. *Gain scores by race/ethnicity*

	White	**Black/AA**	**Hispanic/Latino**	**Mixed/Other**	***p***
Core density	$.01_3$	$.15_3$	$-.32_{1,2,4}$	$.18_3$	**.001**
Transitivity [a]	$.00_3$	-.03	$-.14_{1,4}$	$.02_3$	**.036**
Core diversity[a]	-.17	$-.71_4$	.25	1.00_1	**.031**
Degree concrete support[a]	.18	-.04	-.14	.28	**.046**

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD post-hoc comparison; subscript numbers refer to the group columns in the order listed in the table
[a] Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.
* $p < .05$. ** $p < .01$.

Next, analysis of group differences in the gain scores by T1 living situation resulted in one statistically significant non-parametric difference in the group means. There was a difference in change in core network size by T1 living situation (Kruskal-

Wallis H = 8.968, p=.030), with different group means for youth living with foster family at T1 (added .64 core members), living with biological family (added 2.67 core members), living alone (added 2.25 core members), and living with others (lost .33 core members).[7]

Lastly, the gain scores were analyzed by cluster groups, which had one statistically significant group difference in the gain scores. Parametric analysis of variance showed a difference in gains in Family members in the core network ($F = 3.728$, $p = .026$), where highest-support Cluster B lost 1.40 core members in the Family category between T1 and T2, which was significantly different than the gains in core Family reported by participants in high-support Cluster C (.80 members) and lowest-support Cluster D (1.14 members), according to post-hoc comparisons (Tukey HSD at $p < .05$).

Membership Stability by Individual-level Predictors

Next, member stability can be explored by the same predictors to test for differences in the distribution of stable versus non-stable (appearing at T1 or T2 only) ties for each participant by race, living situation, or cluster; in other words, do participants in these different predictor categories have different degrees of member turnover or stability over time? First, race/ethnicity was not associated with any of the member stability variables (not shown), but there are statistically significant non-parametric group differences by living situation. As shown in Table 5.13, T1 living situation was

[7] Note that gain scores were not run by T2 living situation, as there is not a theoretical reason to suggest that changes in network structure and support would result in one living situation or another at T2, without factoring in whether there was also a change in living situation; however, follow-up parametric ANOVA and the non-parametric alternative showed no statistically significant group differences in the gain scores by whether participants reported a change in living situation between T1 and T2.

associated with the number of unstable ties, such that the category for living with foster family had more T1-only members compared to living with biological family, more T2-only ties compared to living with others (although youth living with biological family at T1 had the most T2-only ties overall), and more total core ties over time, compared to living alone. Next, T2 living situation was associated with the number of stable core ties and total core ties, such that the youth living with foster family had more stable ties than those living alone, and more total ties than those living with biological family or alone.

In summary, living with foster family at T1 is associated with more tie turnover, in terms of total T1-only ties, but these T1-only ties are fully replaced by T2-only ties, and these networks have the most total ties overall. (This may explain the total core tie difference with biological family at T2, which is the only membership stability finding associated with living with biological family.) Generally, youth living independently, either alone or with others, have fewer ties but lower turnover compared to those living with foster family; this will be further discussed as a future research and practice implication. Given that youth living with foster family are likely in Clusters B and C (see Table 5.9), this may explain differences in membership stability by cluster, specifically in the number of T1-only ties, stable ties, and total ties; the clusters associated with living with foster family account for the group differences, where higher-support Clusters B and C have the most ties, and lower-support Clusters A and D have the fewest.

Table 5.13. Membership stability by living situation and cluster

	T2 Living Situation					T2 Living Situation					Cluster at T1				
	Fost.	Bio.	Alone	Other	***F***	Fost.	Bio.	Alone	Other	***F***	A	B	C	D	***F***
T1-only ties	3.82_3	1.67	$.75_1$	3.11	**3.81***	3.88	1.40	2.60	3.00	1.88	$.60_{2,3}$	$4.80_{1,4}$	3.50_1	2.29_2	**8.12****
T2-only ties	4.45_4	4.67	3.00	2.56_1	**3.51***	4.50	3.00	2.80	3.67	1.45	3.00	4.20	3.90	3.29	.590
Stable ties	4.27	2.67	4.50	3.67	.59	4.88_3	3.60	1.80_1	4.44	**3.18***	3.20	5.20	4.80_4	2.29_3	**3.82***
Total core ties	12.55	9.00	8.25	9.00	**3.04***	$13.25_{2,3}$	8.00_1	7.20_1	10.78	**6.23****	$6.80_{2,3}$	$14.20_{1,4}$	$11.90_{1,4}$	$7.86_{2,3}$	**12.93****
Percent stable ties[a]	.36	.30	.53	.39	1.12	.39	.45	.26	.42	1.04	.47	.38	.42	.28	1.20

Note. The membership stability variables are averages for all participants (reported in Table 5.11); group means reflect differences in the distribution of ties by stability within each category (e.g., participants living with foster family at T1 reported an average of 3.82 ties that were named at T1 only).

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD post-hoc comparison. Within each predictor, subscript numbers refer to the category columns in the order listed in the table.

[a] Variable is not normally distributed. Non-parametric Kruskal-Wallis H tests (not shown) were not significant at $p < .05$.

* $p < .05$. ** $p < .01$.

Summary of Findings

- Core density decreased for the Hispanic/Latino group compared to all others, and transitivity decreased for the Hispanic/Latino group compared to White or Mixed/Other.
- Core diversity decreased for Black/African-American participants compared to the Mixed/Other group. Concrete support per tie increased in the White and Mixed/Other groups and decreased in the Black and Hispanic/Latino groups.
- Living with foster family at T1 is associated with more stable ties and more tie turnover, but T1-only ties were replaced by T2-only ties, resulting in the most total ties. Generally, youth living independently, either alone or with others, have fewer ties but lower turnover compared to those living with foster family.
- The clusters associated with living with foster family are also associated with the most core ties. Higher-support Clusters B and C have the most T1-only ties, stable ties, and total ties, and lower-support Clusters A and D have the fewest.

Aim: Compare tie-level characteristics and support by tie-level role, category, and stability.

As will be reported in detail in the findings for Research Question III, many of the reasons participants gave for the presence or absence of particular core ties at T2 are reflected in the relational characteristics measured on the network grid. For example, increasing or decreasing "closeness" or support frequency are common reasons given for new or absent ties. Additionally, the presence of service roles accounts for many core member changes, given transitions in service usage and workplace turnover of providers. It follows from these respondent explanations that both relational qualities (frequency, closeness, duration, overall strength) and support per tie could be explored at the tie-level in terms of types of member roles, compositional category, and tie stability over time.

Tie-level analysis allows for consideration of the characteristics of each unique core tie named by the participants at T1 and/or T2 (n=280), as opposed to analysis of the mean tie characteristics for each network at T1 or T2. (Note that for stable core ties, characteristics reflect T1 measurement, so that for all tie stability types, tie characteristics reflect the first and/or only time the tie was named.) Because the tie-level variables are not normally distributed, non-parametric tests were run to determine if there were group mean differences in tie strength and support provision by whether the core member is in a Parent or Service role, as well as how these members are categorized on the network map, and the stability of each tie over time. Additionally, parametric ANOVA was run to determine group differences with post-hoc comparisons. See Table 5.14 for tie-level analysis of whether these predictors (role type, compositional category, and tie stability) have statistically significant associations with strength indicators or support provided.

Table 5.14. *Tie characteristics by tie type (n=280)*

	Role Type				Tie Category				Tie stability			
Relational characteristics and Support Per Tie	Parent (n=54)	Service (n=52)	Others (n=174)	***P***	Family (n=92)	Friends (2=102)	SWO (n=86)	***P***	T1 only (n=78)	T2 only (n=98)	Stable (n=104)	***p***
Over all tie strength (1-3)	$2.51_{2,3}$	$1.75_{1,3}$	$2.27_{1,2}$	**.000**	$2.49_{2,3}$	$2.26_{1,3}$	$1.84_{1,2}$	**.000**	2.10_{3}	2.18	2.34_{1}	**.004**
Tie frequency (1-3)	2.13_{2}	$1.60_{1,3}$	2.24_{2}	**.000**	2.16_{3}	2.32_{3}	$1.77_{1,2}$	**.000**	1.96	2.21	2.10	.088
Tie closeness (1-3)	2.59_{2}	$1.81_{1,3}$	2.39_{2}	**.000**	2.54_{3}	2.42_{3}	$1.97_{1,2}$	**.000**	2.19_{3}	2.21_{3}	$2.52_{1,2}$	**.000**
Tie duration (1-3)	$2.87_{2,3}$	$1.83_{1,3}$	$2.16_{1,2}$	**.000**	$2.78_{2,3}$	$2.14_{1,3}$	$1.77_{1,2}$	**.000**	2.14_{3}	2.09_{3}	$2.44_{1,2}$	**.003**
Support multiplexity (1-3 types)[a]	2.59	2.50	2.56	.588	2.46	2.66	2.55	.243	2.44_{3}	2.46_{3}	$2.74_{1,2}$	**.007**
Emotional support (0-4)[b]	2.87	2.94	2.90	.950	2.86	2.97	2.86	.707	2.79	3.18_{3}	2.71_{2}	**.024**
Informational support (0-4)[b]	2.20	2.62_{3}	2.04_{2}	**.045**	1.93_{3}	2.08	2.56_{1}	**.006**	2.10	2.11	2.30	.581
Concrete support (0-4)[b]	2.04	1.54	1.74	.228	1.83	1.78	1.66	.658	1.55_{3}	1.61	2.06_{1}	**.022**
Total support from tie (1-12)	7.13	7.21	6.66	.413	6.63	6.81	7.13	.245	6.47	6.89	7.10	.603

Note. None of the dependent variables are normally distributed. Significance levels are for the nonparametric Kruskal-Wallis H test for three or more independent groups. Parametric ANOVA confirmed statistically significant group differences, and the reported post-hoc differences are Tukey HSD or Games-Howell, depending on equality of variance ($p < .05$). For each predictor, subscript numbers refer to the category columns in the order listed in the table.

[a] This indicates how many of the support types (emotional, informational, concrete) were provided, regardless of domain(s).

[b] This indicates the number of domains in which the support type was provided.

As seen in Table 5.14, all of the tie-level relational and support predictors distinguish groups on some tie characteristics, including tie strength indicators, whether each type of support was provided in any of the four program domains, how many of the three types of support were provided in any domain, and the total support provided across type and domain. First, Service roles have lower ratings for tie frequency and tie closeness, compared to Parents or Other. For tie duration and overall strength, there are differences between all groups, with Parent roles as the strongest and longest-lasting, followed by Other ties, and Service ties are of shorter duration and are weakest overall. Lastly, Service roles provide informational support in the most domains, compared to Parents or Other.

Compositional category is also associated with tie characteristics, such that all of the strength indicators, as well as the provision of informational support, show group differences by how participants categorized the tie when they put that person on their network map. Here, core ties categorized as Friends and Family have more frequent contact and higher levels of closeness than those in the School/Work/Other category. Additionally, there are significant group differences between all three categories on relationship duration and overall tie strength, with the highest group means for Family, then Friends, and the lowest means for the School/Work/Other category. In contrast, ties in the School/Work/Other category provide the most informational support per tie, compared to the Family group.

Lastly, whether ties were stable, or were only named at T1 or at T2, distinguished group means for most relationship and support variables. Compared to T1-only or T2-

only ties, ties that were stable over time were significantly closer and of longer duration (as initially measured at T1). Compared to T1-only ties, stable ties were also stronger overall. Additionally, stable ties had higher levels of multiplexity compared to T1-only and T2-only ties, in terms of providing more support types per tie on average. Stable ties were less likely to provide emotional support, compared to T2-only ties, and more likely to provide concrete support compared to T1-only ties.

A follow-up chi-square test of the distribution of role type by tie stability shows that these are not independent variables (x^2=19.525, p=.001), and there is a difference in the distribution tie stability by roles. 61% of Parent ties are stable, while 19% are T1-only and 20% are T2-only. Conversely, 35% of Service ties are stable, 37% are T1-only, and 29% are T2-only. Among all other ties, 31% are stable, 28% are T1-only, and 41% are T2-only.

Tie stability is also associated with compositional category (x^2=15.547, p=.004). 53% of Family ties are stable, 20% are T1-only, and 27% are T2-only. Among the ties in the Friends category, 28% are stable, 31% are T1-only, and 40% are T2-only. In the combined category for School/Work/Other ties, 30% are stable, 28% are T1-only, and 35% are T2-only. The finding that ties categorized as Family are more likely to be named at both measurements is expected and will be discussed further in the next chapter in the context of the literature and the other findings. On the other hand, the finding that ties categorized as Friends are more likely to be added at T2 Friends is unexpected and may be associated with adolescent developmental factors as these participants undergo the transition to increased independence, as will be discussed further.

Compared to the role type and tie category predictors, tie stability was associated with the most tie-level characteristics in the analysis of variance. To explore this finding further, tie stability was modeled as a dichotomous dependent variable (tie is stable or not) with the same tie-level characteristics of strength and support from Table 5.14 as predictors. A multiple logistic regression of these predictors on whether a tie was stable (n=104), produces a statistically significant model (x^2=34.540, p=.003). In this regression, support multiplexity was the only statistically significant predictor (OR=2.064, p=.016), such that a unit increase in support multiplexity (1-3) doubles the odds of a tie being stable over time. In other words, providing concrete support and emotional support, instead of just concrete support, doubles the odds that the tie will be named at both T1 and T2, compared to only being named at either T1 or T2. This finding for multiplexity confirms the influence of multiple relational roles or content found elsewhere in the personal network and social support literature (see Walker et al., 1993 for a review); relationships that are more broadly supportive are more likely to last, and relationships that last are more likely to be more broadly supportive.

Summary of Findings

- Service roles have lower ratings for tie frequency and closeness, compared to Parents or Other. Parent roles are the strongest and longest-lasting, followed by Other ties, and Service ties are of shortest duration and are weakest overall. Service roles provide informational support in the most domains, compared to Parents or Other.

- Friend and Family ties have more frequent contact and higher levels of closeness than those in the School/Work/Other category. Family ties are the oldest and strongest relationships, followed by Friends, and School/Work/Other ties are the newest and weakest overall. School/Work/Other ties provide more informational support than Family ties do.
- Ties that were stable over time were closer and of longer duration. Stable ties were less likely to provide emotional support, compared to T2-only ties, and more likely to provide concrete support compared to T1-only ties. Stable ties had higher levels of multiplexity compared to unstable ties. Support multiplexity predicts ties stability; the added provision of each support type doubles the odds of a tie being stable.
- Members categorized as Family, and specifically Parent roles, are more likely to be stable ties, followed by School/Work/Other ties (and specifically Service roles), and then Friends. Friend ties are more likely to be added at T2.

Research Question III: Is this a valid way to measure and analyze these networks?

Aim: Evaluate the reliability of the network instrument.

Respondent Recall

An important issue in network measurement is the ability of respondents to accurately recall who is in their network at any given time, and this reliability risk is exacerbated if comparing networks over time, where actual network instability can be hard to distinguish from measurement error (Morgan, et al., 1996; Tracy, et al., 1990; Wright & Pescosolido, 2002). To test the reliability of this measure, as well as to gather important qualitative information about support network instability in terms of member turnover, respondents were asked about core support network members they only named once (Appendix C). Respondents were only asked about core ties because there was not enough information provided about non-core ties to assess whether they had been named at both time points (e.g., members may have the same initials).

As part of the T2 data collection, T1 and T2 core networks were compared and participants were asked to briefly indicate why they had not named a tie(s) at T2 that they previously named at T1, and/or why they had not previously named any new T2 tie(s) (as in Wright & Pescosolido, 2002). Responses were aggregated and open-coded (Strauss & Corbin, 1990) and are reported in Table 5.15. Although this method provided valuable qualitative information illustrating why network ties changed from the participant perspective, the original purpose was to determine how often respondents reported that they simply forgot about someone at one time point if they had recalled this person as regularly supportive at another time point.

Table 5.15. *Participant reasons for network turnover*

Reason T1 tie was not named at T2	*(n=78, 2 missing responses)*
not case worker/case manager/teacher/advisor/youth worker anymore	15 ties (19% of T1-only ties)
not close like they were/"just don't talk as much"/no conflict indicated	11 (14%)
not in same class/job anymore	11 (14%)
falling out/conflict indicated	10 (13%)
moved away/other circumstance (person is in hospital, passed away, etc.)	10 (13%)
fell out of touch/no conflict or reason indicated	8 (10%)
don't remember who this person is	5 (6%)
forgot to mention this person at T2	3 (4%)
ran out of room on network grid at T2	3 (4%)
Reason T2 tie was not named at T1	*(n=97, 1 missing response)*
"closer now" or "more supportive"	23 ties (24% of T2-only ties)
new friend/co-worker/classmate	20 (21%)
"talk more now" or "hang out more now"	13 (13%)
new case worker/case manager/teacher/advisor/youth worker	10 (10%)
new CCS mentor	7 (7%)
forgot to mention this person at T1	6 (6%)
resolved conflict (three of these were conflict with biological family)	6 (6%)
family member newly in contact	5 (5%)
person moved back to the area	5 (5%)
new mentor (not CCS)	2 (2%)

As seen in Table 5.15, many of the reasons participants gave for the presence or absence of particular core ties at T2 are reflected in the relational characteristics measured by the core network grid. For example, increasing or decreasing "closeness" is a common reason given for new or absent ties, and changes in support frequency are also

common reasons for changes in core tie membership. Additionally, the presence of service roles in the networks accounts for many core network changes, given transitions in services received and worker turnover, as well as changes in the amount and types of support provided to the participant. (These respondent explanations referring to both relational qualities and support provision informed the previous research question aims exploring these indicators by member roles, compositional category, and tie stability over time.) However, in some cases, core members were named only once because the participant forgot to mention that person at the other time point, and would have included them in the network had they remembered, and this is considered measurement error.

As seen in Table 5.15, respondents confirmed some measurement error at both time points. First, 4% of the T1 ties that were not named at T2 were not initially named because the participant forgot about that person when asked about their network at T2; these members were added to the T2 network if desired, after documenting that they were initially forgotten. Note the distinction between these initially-forgotten ties, which were easily recalled when prompted, and the T1 ties that respondents could not remember at T2 (6% of T1-only ties were people respondents could not recall, even with that person's initials to remind them). Additionally, asking why some T2 ties were not included at T1 revealed that 6% of these absent ties were not in the T1 core because the respondent forgot about this person when asked at the earlier date (in these cases, the T1 network was not changed, which may be a measurement limitation). The occurrence of forgotten ties is similar to the 3-7% rate reported in Wright and Pescosolido's study (2002) using a similar protocol with adults experiencing mental illness; further, three participants (11%)

in this study indicated that they had forgotten a tie at T2, which is comparable to 5-15% in the Wright and Pescosolido study (which only measured T1 ties forgotten at T2).

Otherwise, analysis of the reasons ties were not stable over time indicates that respondents could nearly always provide a relational or circumstantial reason why they did not mention a network member at both measurements. Longitudinal network methodology is prone to reliability problems when it cannot be determined whether changes in network indicators over time reflect measurement error or reflect actual changes in personal networks, which are expected to be more or less dynamic. This documentation of forgotten core ties addresses this respondent-recall reliability risk and suggests that the reported changes in the network variables over time likely reflect actual changes in the participant support networks (as operationalized here), as opposed to reflecting measurement error due to recall problems.

Test-Retest Reliability

Next is consideration of the test-retest reliability indicated by correlations between the T1 and T2 values reported in Table 5.10. In this case, two assumptions of most test-retest reliability procedures, that measurement is repeated over a short period of time, and that constructs are not expected to change between measurements, are not made in this case. Measurement was not repeated over a short period of time and some network change is expected between the two measurements. Therefore, this discussion will focus on a number of bivariate correlations that may indicate that, although networks may have changed between measurements, there is moderate consistency in how the constructs are being measured over time. First, Table 5.10 shows medium to large correlations ($p<.05$)

between the T1 and T2 values on most (64%) of the primary network variables. This particularly includes many indicators of theoretical interest, including network and core size, core density, tie strength (and frequency and duration, specifically), some compositional measures (including number of Parent and Service roles in the core), all of the total support variables, and degree of emotional support. These correlations may indicate some measurement reliability, given that networks are expected to change over time.

On the other hand, Table 5.10 also shows small to medium non-significant correlations between the T1 and T2 values on many variables of theoretical interest, including the structural measures of network density and transitivity (although core density is strongly correlated over time [.613**] and is of particular theoretical interest here). Further, the compositional diversity measures have medium non-significant correlations over time, which may speak to lower reliability of this indicator in this study. Additionally, reliability is not demonstrated for some of the compositional variables, or for tie closeness, or for most degree of support measures. This may reflect poor instrument repeatability, including a potential testing effect at T2.

Another possible explanation for the lack of correlation between the T1 and T2 values for some of the variables may be the use of three interviewers to administer the network map and grid at T1, whereas all the interviews were conducted by this author at T2. Previous research has established that interviewer effects can influence the reliability of primary network variables (Marsden, 2003). To further explore this potential risk, ANOVA was conducted using 15 primary T1 structural and compositional variables to

test whether there were statistically significant mean differences by whether the interviewer was this author (n=20) or one of two other program staff (n=14). Two interdependent structural variables, network density and core density, had statistically significant non-parametric group differences by interviewer: network density was higher (p=.011) for youth participants interviewed by this author (M=.33, SD=.197) compared to the other interviewers (M=.18, SD = .144), and core density was higher (p=.016) for participants interviewed by this author (M=.39, SD=.237) compared to other interviewers (M=.21, SD=.129).

These are important variables to measure reliably, given that density is the primary structural measure reflecting the added value of network-based measurement. The difference between the means by interviewers is likely due to more familiarity with the measure and administration protocol on the author's part, and therefore more probing of participants regarding connections between the network members named (e.g. "you named your caseworker and your foster parent—do they also know each other?"). There were, however, no statistically significant paired-sample differences in the density or transitivity structural variables between T1 and T2 (as reported in Table 5.10), which may indicate that this inter-rater reliability risk did not influence other findings (additionally, core density is correlated over time, r=.613**, indicating some reliability of the measure regardless of the multiple interviewers at T1).

Other indicators of the reliability of this measurement method are some of the observed correlations between the T1 indicators of distinct constructs (Appendix A – Table A.4) and between the gain scores for some of these constructs (Appendix A –

Table A.6), which reflect some expected relationships between measureable aspects of networks and may indicate some reliability built into the measurement design and administration protocol. For example, network size and density are expected to be negatively correlated, as is observed here at T1 (-.403**), and this relationship is also evident in the correlation of the gain scores, indicating that these network measures also "hang together" over time (-.639**). Additionally, many of the variables that are correlated over time also show statistically significant paired-sample differences between T1 and T2, which suggests that these network indicators are both specific to the construct being measured and sensitive to change over time. For example, the size measures for the networks and the core have large and statistically significant correlations over time, but these also show statistically significant change between measurements (Table 5.10).

As stated above, the methodological issue of whether repeated network measurements reflect measurement error or capture actual change in networks over time is an important one (Morgan et al., 1996; Walker et al, 1993), and will be further addressed in the next chapter. For now, the tentative and preliminary finding is that the associations discussed above—between the T1 variables, between the gain scores, and within the network indicators over time—indicate promising measurement reliability of these network constructs. However, acknowledging the high risk of Type I error in this exploratory study, it is possible that any of these statistically significant correlations, or any of the group differences reported herein, are false positives. Future studies will be informed by the measurement issues discussed here, and future analyses will be more hypothesis-driven, following from the reported exploratory findings.

Summary of Findings

- This documentation of forgotten core ties suggests that the reported changes in the network variables over time likely reflect actual changes in the participant support networks, as opposed to reflecting measurement error due to recall problems.
- There are medium to large correlations between the T1 and T2 values on most (64%) of the primary network variables. This includes many indicators of theoretical interest, such as network and core size, core density, tie, indicators of the number of Parent and Service roles in the core, all of the total support variables, and degree of emotional support. These correlations may indicate some measurement reliability.
- In general, compositional indictors (by category and by diversity) may be less reliably measured in this study. Additionally, reliability is not demonstrated for tie closeness, or for most degree of support measures.
- Interviewer effects are indicated for the baseline measurement, but there is no indication this affected any findings.
- Reliability is also indicated in the observed correlations between the T1 indicators of distinct constructs and between the gain scores for some of these constructs, which reflect some expected relationships between measureable aspects of networks and may indicate some reliability built into the measurement design and administration protocol.

Aim: Explore the construct validity of the network instrument.

Construct Validity

To further investigate potential measurement issues, participants completed a checklist of 26 social roles (Appendix C) expected to appear in many of the support networks in this sample (e.g. biological and foster family members, coworkers and school friends, caseworkers and lawyers). These roles were organized within the same compositional categories used on the network map, although the broad category names were not displayed on the form the way they were laid out as organizing quadrants on the map. Note that the social roles list separately measured the presence of roles at both time points, although the measure was only administered at T2, when participants were asked to retrospectively recall their T1 supports in terms of roles.

The primary question for the role measure was the same as the T2 network map—"who has provided you support in the last 6 months?"—and the purpose was preliminary multitrait-multimethod (MTMM; Campbell & Fiske, 1959) exploration of whether the network measure captures participant support networks in terms of the range of social roles that may provide support. There are three "traits" compared within and across the two measures to explore construct validity: network support capacity, compositional diversity, and categorical distribution. Table 5.16 presents the matrix of correlations of traits by method, absent the method reliability measures (the "reliability diagonal") that would make this a true MTMM matrix. In the MTMM matrix, the "heterotrait-monomethod" triangles reflect within-method (the support network measure or social role measure) consistency. The two shaded "hetero-method" blocks reflect the correlation of

the same traits measured by different methods, and the non-shaded blocks are the mono-method and hetero-method comparisons of traits that are not expected to be correlated between or within measurement methods.

First, the upper left corner shows a previously reported correlation between network size at T1 and T2 (.558**), as well as the smaller non-significant correlation (.314) in the network diversity indicator over time (as shown in Table 5.10). The matrix also includes the confirmatory within-method correlation of network size and diversity at T2 (.439*), which is expected and was observed at T1 in the full sample (see Appendix A – Table A.4; note that the matrix only includes retained participants, and the moderate relationship between T1 size and diversity is not observed in the smaller sample). Within the social role method, there are large correlations in total roles (.767**) and in role diversity (.791**) over time, as well as large correlations between total roles and diversity at each time point (.686** and .662*), and across time points (.462* and .664**), indicating reliability within and between traits in the role measure over time. One caveat is that the T1 and T2 role indicators were measured at the same time; this could explain the high correlations seen here, which may not be observed with separate measurements. Overall, the matrix confirms within-method reliability by trait and between related traits for both measures.

Table 5.16. *Within-method and between-method correlation of traits*

	Network measure				**Role Measure**				**Network Categories**				**Role Categories**		
	T1 size	*T2 size*	*T1 div.*	*T2 div.*	*T1 total*	*T2 total*	*T1 div.*	*T2 div.*	*Family*	*Friend*	*S/W*	*Other*	*Family*	*Friend*	*S/W*
Network															
T1 net. size	-														
T2 net. size	**.558**†	-													
T1 diversity[a]	.331	.347	-												
T2 diversity[a]	.089	**.439***	.314	-											
Roles															
T1 total roles	**.442***	**.631**†	.387	.344	-										
T2 total roles[a]	**.486***	**.747**†	**.439***	**.426***	**.767**†	-									
T1 diversity[a]	.267	.369	.242	.198	**.686**†	**.462***	-								
T2 diversity[a]	**.464***	**.608**†	.258	**.513****	**.664**†	**.662***	**.791**†	-							
Network															
Family	-.226	-.277	-.340	-.154	-.036	-.002	.035	-.042	-						
Friends	.348	.363	**.456***	.190	.123	.248	.081	.153	**-.549**†	-					
School/Work[a]	.005	-.055	.101	**.414***	.032	-.022	-.060	.049	.316	-.182	-				
Other	-.123	-.068	-.336	-.069	-.018	-.029	.030	.017	.073	-.338	**-.592**†				
Roles															
Family	-.027	-.062	.031	-.148	.013	-.140	.145	-.047	.187	-.166	.370	**-.491***	-		
Friends	-.074	.004	.036	.036	-.167	.041	-.319	-.149	.013	**.452***	.234	-.244	**-.404***	-	
School/Work	-.155	-.103	.078	.078	-.041	-.241	.064	.045	.004	**-.486***	.283	.343	-.361	-.361	-
Other	.263	.164	-.007	-.007	.226	.266	.085	.115	-.246	.088	**-.420***	**.585**†	**-.392***	**-.408***	-.025

[a]Note that the variable is not normally distributed, so the reported correlation is Spearman's rho. * p < .05. † p < .01.

Next, some convergence is expected across the methods between network size and the number of social roles, as these measure similar constructs. Although the role list is designed to be independent of the number of people in the role (e.g. "siblings" is a single item), there should be a relationship between these indicators of network support capacity. There are consistent medium to large correlations between network size and total roles across the methods at each time point (.486* and .747**), and across time points (.486* and .631*), confirming the convergent validity of the trait across methods and over time. Further, convergence is expected between indicators of the compositional diversity of network members and social roles, reflecting whether at least one member or role is selected in each of the categories. There is less correlation in the compositional diversity indicators, and small and non-significant correlation at T1, which may reflect the inter-rater reliability issues at T1 and the retrospective recall of roles at T2. However, there is a large and significant correlation between the diversity indicators at T2 (.513**), providing some confirmation of the compositional diversity trait across methods. Additionally, there are significant relationships between the network indicator of capacity (size) and the social role measure of diversity at T1 (.464*) and T2 (.608**), indicating some convergence across methods in traits expected to be correlated within methods.

Next, some convergence is expected between indicators of the categorical distribution of network members or roles (e.g. networks primarily composed of members in Family should correlate with role lists primarily composed of Family roles). To test this, the categorical distribution of the network ties was calculated as a proportion of all ties, and the distribution of social roles by category was calculated as a proportion of all

roles. Because the retrospective recall of T1 social roles was confusing for many respondents, the categorical distribution trait is only compared at T2. First, the matrix confirms some expected negative relationships between the categories within both the methods, particularly between the informal Family and Friend categories that account for most of the network members and social roles. There is a large negative correlation between the network categories for Family and Friends (-.549*), and a medium negative correlation between the Family and Friend categories (-.404*) in the role method. There are also large negative correlations between the service-oriented categories of School/Work and Other within the network method (-.592**), and medium negative relationships between the Family and Other categories (-.392*) and between the Friend and Other categories (-.408*) within the role method. For both the methods, this provides some confirmation of within-method trait reliability. Importantly, there are also medium to large negative correlations between some category combinations across the methods, and large positive relationships between the two Friend categories (.452*) and the two Other categories (.585**), indicating convergence in these across methods. However, there are only small and non-significant relationships between the Family categories and between the School/Work categories across methods, which indicates a lack of convergence for these categories.

Lastly, the matrix reflects discriminant validity in the pattern of smaller, non-significant correlations where there would not be an expected relationship between variables. For example, network size and diversity indicators are not related to compositional categories elsewhere in this study, so it is not expected that these would be

associated with role categories either. Similarly, there are smaller and non-significant relationships between the total role and role diversity indicators with the network categories. The lack of association between these unrelated traits within and across methods provide some confirmation of the discriminant validity of the network instrument, or the ability to distinguish between relatively unrelated support network constructs.

Overall, construct validity seems to be mixed. The preliminary MTMM approach indicates construct validity of the support capacity and compositional diversity traits, but does not seem to meaningfully distinguish between categorical distribution of social roles. This may be due to the administration protocol related to categorical distribution: whereas participants were instructed to categorize network members as they wished on the network map (e.g. a school friend could have been put in School/Work or Friends, or a romantic partner in Family or Friends), the compositional categories for these specific roles were predetermined on the role instrument. On the other hand, the Other category on the network map was the only category that was explained as including certain roles (recalling that participants were told that caseworkers, mentors, etc., could be in the Other category), which matches the organization of the role list, and it is this compositional category that has the largest correlation between the two methods.

Comparison of Social Support Measures

The Medical Outcomes Study Social Support Survey (MOS; Sherbourne & Stewart, 1991) was included to explore the social support captured by the network measure in comparison to a standardized measure of the perceived availability of

functional social support. There is mixed normality of the network variables at T1 and none of the MOS variables (sum scores or sub-scale averages) are normally distributed at T1. Non-parametric bivariate analysis showed no correlation between the MOS variables and any of the primary network variables. Further, non-parametric analysis showed no statistically significant group differences between the individual-level variables (race/ethnicity, living situation, gender, intervention group, and retention) with any of the MOS variables at T1 or T2. Next, bivariate correlations were run to test convergent construct validity between the two support measures. Table 5.17 shows multiple large and statistically significant correlations between the total MOS sum scores and subscale averages and the network-based support totals, as well as the core network "supportiveness" variables, confirming that that the MOS and the network instrument are measuring similar constructs.

Table 5.17. *Comparing network-based support and perceived support*

		MOS support subscales			
T2 support variables	MOS sum score[a]	Emotional/ Informational[a]	Tangible[a]	Positive interaction[a]	Affectionate[a]
Total support provided	**.561****	**.600****	**.449***	**.478***	.365
Emot. support provided	**.389***	**.410***	.292	.311	.133
Info. support provided	**.545****	**.642****	**.428***	.379	.303
Concrete support provided	**.539****	**.563****	**.450***	**.514****	**.454***
Degree support from core	**.440***	**.498****	.362	**.527****	.205
Degree of emot. support[a]	.220	.172	.217	.377	.004
Degree info. support	**.461***	**.587****	.321	**.424***	.177
Degree of concrete support	.353	.362	.303	**.542****	.323

[a]Note that the variable is not normally distributed, so the reported correlation is Spearman's rho.
* $p < .05$. ** $p < .01$.

Although the MOS scores were consistently associated with the network support variables, there was no association with any of the other primary network measures, or any of the individual-level grouping variables tested here—including race/ethnicity, living situation, cluster, or intervention group—both of which showed mixed association with network-based measures of support. To further explore the relationship between the two measures of social support, follow-up analysis attempted to parse whether the support provision captured by the network instrument was differently predictive of outcomes, compared to the MOS measure of perceived support. The MOS scores have been used in major outcome studies with this population (e.g. Courtney, et al., 2005), and although this isn't otherwise an outcome-oriented study, it made sense to compare the measures on the primary outcome variable available for analysis, participant enrollment as college students at T2.

Participants for this study were enrolled in post-secondary education or career training programs at T1, or were expected to enroll over the course of the study (see Table 4.1 for T1 enrollment). At T2, 70% (n=19) of participants were enrolled in college courses or a career training program, 22% (n=6) were not enrolled, and 7% (n=2) had graduated. The MOS and the network-based support scores were analyzed with T2 enrollment (or graduation) as the dependent variable, and Table 5.18 shows that the support provision captured by the network measure at both time points is predictive of enrollment at T2. Enrollment is predicted by almost all of the network support variables, and this is one of the few findings where core tie "supportiveness" is a statistically significant predictor. However, there are no statistically significant differences between

the group means on any of the MOS variables, although a similar non-significant pattern in the group means is observed (see Appendix A – Table A.8). This indicates that, for the participants in this study, network-based support provision was more statistically predictive of post-secondary retention than the standardized MOS measure of perceived support.

Table 5.18. *Comparing enrollment by network-based support and perceived support*

T1 support variables	**Not enrolled**	**Enrolled or graduated**	***p***
Total support provided (0-120)[a]	23.33	53.38	**.031**
Emotional support provided (0-40)	9.33	21.05	**.013**
Informational support provided (0-40)[b]	6.50	17.24	**.010**
Support in academic domain (0-30)[b]	5.00	14.76	**.004**
Support in career domain (0-30)[a]	5.00	11.90	**.044**
Degree of support from core (0-1.0)	.37	.59	**.020**
Degree of emotional support[a]	.28	.72	**.007**
Degree of informational support	.32	.58	**.016**
T2 support variables			
Total support provided (0-120)	32.83	64.67	**.010**
Emotional support provided (0-40)	14.33	26.33	**.006**
Info. support provided (0-40)	9.33	20.62	**.016**
Support in academic domain (0-30)	6.50	16.76	**.002**
Support in career domain (0-30)[a]	4.50	14.52	**.002**
Degree of support from core[b]	.47	.70	**.021**
Degree of emotional support[a]	.63	.84	**.034**
Degree of academic support	.46	.71	**.027**
Degree of career support	.31	.63	**.011**

[a]Variable is not normally distributed. P-value is for the non-parametric Mann-Whitney U test.
[b]Variable fails Levene's test of homogeneity of variance. P-value is for the Welch statistic.

Summary of Findings

- Preliminary analysis indicates construct validity of the support capacity and compositional diversity traits, but does not support the validity of the measures of categorical distribution, consistent with a lack of statistically significant findings for the compositional categories throughout this study. Discriminant validity is demonstrated.
- Convergent construct validity is demonstrated between the network measure of social support and a standardized measure of perceived social support (MOS).
- Enrollment is predicted by most of the network support variables (one of the few findings related to tie "supportiveness"). The MOS did not predict enrollment as an outcome.

CHAPTER 6: Discussion

This study was intended to be an exploratory and preliminary attempt to determine how personal network methods could be applied to understand network-based support provision, and to assess how support networks may change over time, among a population of transition-age adolescents with foster care experience. In this case, the sample was specifically connected to ILP and/or college-based services for youth with foster care experience, introducing the opportunity to consider aspects related to post-secondary education involvement (e.g. supportive relationships with school-based staff and enrollment status as an outcome). On the other hand, this high-functioning convenience sample of youth is not presumed to be generalizable to the majority of older youth aging out of foster care, as will be further discussed as a study limitation.

The findings highlighted here describe the support networks, compare these over time to assess stability, and evaluate the reliability and validity of the network instrument. The following discussion is geared towards evaluating the effectiveness of this methodology (including various analytical approaches) as a tool for future research with larger samples that may not be specifically connected to ILP services or post-secondary education (which may provide more variability on network indicators). The intention is not to draw firm conclusions about the support networks of transition-age youth in general or assess the relationship of individual predictors to network-related indicators or outcomes. Rather, the goal is to summarize and discuss this first exploratory step of a broader research agenda that will be designed to draw conclusions about whether and how individual-level predictors and/or network-based properties can distinguish patterns

of support provision among youth aging out of foster care, in ways that contribute to the presence or absence of social capital, influence network stability and change over time, and ultimately affect youth outcomes.

Network Size, Composition, and Support

Summary of Findings

The support networks of the relatively service-connected youth in this high-functioning sample are compositionally diverse, though most network members are family and friends. Most youth name at least one parent figure and one service-provider (about half include more than one of these roles). Participants said that most network members support them at least monthly (64%), and on average, these people provide weekly support as part of a closer relationship that youth categorize as family. The youth report receiving emotional support most often, followed by informational and concrete support.

Network size, and secondarily, network composition, are most associated with the types and amount of support the youth in this sample report receiving. When these were used to create profiles of networks that predicted the amount of support youth reported, most participants had higher-support profiles (59% in Clusters B and C) including many people from their family, friends, school, and work. Youth with these profiles identified a combination of both parent figures from biological and/or foster families and service-providers from transition programs. These networks are larger and have more relationships that come and go over time, but support is consistent. Most of the participants living with foster family have these kinds of networks, and this may reflect

the built-in formal and informal connections that characterize foster placements that contribute to youth engagement in services and education.

For example, one youth who identified this kind of network (Cluster C) is in a long-term foster placement and has strong relationships with an ILP case manager and a child welfare caseworker, and with a math teacher and an academic advisor. This youth also named a pastor and an old friend as close ties. The service-providing relationships, including the foster parent, are interconnected, which may contribute to the consistent support the youth receives. Similarly, another youth from this cluster also has supportive relationships with her child welfare caseworker, ILP case manager, and academic advisors, but this youth lives with her grandmother and gets support weekly from her aunt and monthly from her step-father. Both these youth were actively enrolled and engaged in college at baseline and follow-up.

Some youth (41% in Clusters A and D) report less support from a smaller network, and these networks tend to have either few informal parent figures or formal service providers. For example, one youth in Cluster A named her grandmother, uncle, and an academic advisor as her monthly supports, and although these relationships were very close and supportive, they primarily provided her concrete support; all these relationships were named again at follow-up, but the youth was not enrolled in school anymore. On the other hand, a youth in Cluster D named two roommates, a caseworker, and an ILP case manager, who each provided one kind of support. Of these, only the ILP case manager was named at follow-up, along with two new service providers, but no informal supports, and the youth was no longer enrolled in college.

The descriptive findings illustrate how different aspects of the social support environment may work individually and in combination to support youth—How many people are supportive? Are they from different social spheres, like family and school? Do they know each other? Are these relationships close and/or stable? Do they provide more than one kind of support?. The following discussion explores these network indicators in more technical terms to reflect the many analyses reported here with consideration of the methodological factors that inform the findings.

Bivariate Trends

The baseline measurement of these networks provides a number of preliminary bivariate associations that illustrate how network concepts can be used to meaningfully describe the relationship between basic network structure and support provision. Overall, larger networks were associated with more compositional diversity and more support provision of all types, and larger cores were associated with core diversity and highly correlated with total support provision. Having a higher proportion of the network in Family, or more Family members in the core, was associated with supportive ties of longer duration, whereas having a higher proportion of the network in School/Work/Other was associated with shorter tie duration, and having more core members in SWO was associated with weaker ties. Relationships categorized as either Friends or Family are more frequently supportive and closer compared to ties in the School/Work/Other category. Additionally, ties categorized as Family (many of which are foster family members) are strongest overall and last the longest, followed by Friends, and then School/Work/Other ties, which are the weakest and most short-lived, although

they provide more informational support compared to Family. These are unsurprising findings, given what is known about the role of family, friends, and place-based ties in personal networks (e.g. Walker, et al. 1993; Wellman & Wortley, 1989, 1990), but there is benefit in assessing the presence of these relational patterns in this specific subpopulation, given concerns about child welfare service involvement and the potential disruption of individual relationships and support systems.

The individual-level predictors of interest had some association with indicators of composition and support provision. First, whether youth lived with foster family at either measurement was the most distinguishing individual-level factor associated with the primary network variables. Participants who reported living with foster family at baseline had more core network members and more network members overall than those who were living with biological family, more emotional support compared to those living alone, and almost twice as much academic support as youth living with others. At follow-up, youth living with foster family still had larger cores (although some would have moved into or out of foster homes between measurements), and they categorized the most members as Family, named the most Parent roles, and reported over twice as much total emotional support compared to youth living with biological family. However, these findings should be considered in light of selection bias: participants were recruited from ILP and school-based service programs, and it may be that these youth have foster families that are more supportive on average in ways that encourage youth participation in services and education.

Race/ethnicity was associated with two of the network indictors. Core diversity for Black/African-American participants decreased over time, relative to the Mixed/Other group, which gained a compositional category over time. Concrete supportiveness increased for White and Mixed/Other respondents, and decreased for Black/African-American and Hispanic/Latino participants. Living situation and race/ethnicity as operationalized here do not seem ideal predictors for analyzing network differences by group in this sample, and although further analysis using these predictors in combination is warranted (e.g. whether the compositional diversity finding for Black/African-American participants is related to living situation), this would require a larger sample (noting that there was no association between race and living situation in this sample).

At this stage, a preliminary finding is that living situation contributes to network aspects (e.g. size and the prevalence of members in the Family category and/or in Parent roles) that are associated with some types of support provision. This may simply reflect that many youth living with foster families are benefitting from built-in service-oriented ties (e.g., foster parent ties to caseworkers) while also maintaining informal ties to biological kin and community. Another possibility is that larger and more supportive foster families encourage youth engagement in transition services, from which this sample was drawn. Relative to the other living situations, living with foster family may increase total support capacity as measured here, which would not imply that other situations were less able to provide necessary support. Instead, the finding may suggest that this methodology is suited to capture the combination of informal and formal support provided by the foster families in this service-engaged, high-functioning sample. Further,

living situation should perhaps be more carefully defined to delineate whether these are service-connected. For example, there is no clarification of whether participants were living with kin as foster providers, and these would have been coded as living with biological family for this study.

It may be the case that network indicators could more usefully relate variations in living situation to practice concepts like placement stability, permanency, and "felt security" (Cashmore & Paxman, 2006), rather than using a broadly-categorized living situation variable to predict aggregate social support. In other words, the finding that living situation was associated with one support type at each time point is not particularly telling, especially given the risk of Type I error. On the other hand, the finding that youth living in foster homes have more members categorized as family, compared to youth living with biological family, warrants further exploration of how these different living situations may reflect the practice objective to provide family-based support systems to youth in foster care, especially given that this is a sample of highly-functioning youth.

Similarly, it may be more meaningful to analyze race/ethnicity as related to service availability and/or client engagement within different kinds of social network structures, rather than using race to independently predict aggregate network-based social support. Here, there was little differentiation in social support by race, but findings (not statistically significant) show that each of the minority subgroups had fewer service-providing roles on average compared to White youth, with Hispanic/Latino youth naming the fewest service providers on average. To illustrate, although there were no statistically significant differences in the cluster variables by race, Hispanic/Latino and Mixed/other

youth combined make up the majority of Cluster A (see Table 5.10), which is distinguished by small, family-based cores and few connections to service-providers; the follow-up research question may be whether having fewer service-providing connections is related to density, where close-knit family networks may inhibit the development of service-providing relationships (or alternatively, may support youth in a way that lowers service needs), or whether this finding reflects disparities in service access related to disproportional delivery of services to minority youth. Further research exploring this difference could be designed to assess how network indicators may interact with race/ethnicity to predict service need, access, and/or engagement.

Lastly, the network-based social support indicators seem to provide meaningful variation, and measurement reliability is somewhat confirmed. Further, network-based support provision as measured here is distinct from perceived support as measured by the MOS, and in further exploration of that finding, network-based support was a better predictor of the program outcome that was available for this analysis: whether study participants were enrolled or graduated at follow-up was associated with both support provision and support per tie by total and type (and this is one of the few findings for core tie "supportiveness"). It may be that the multiple structural, compositional, and relational indicators gleaned from this instrument are not the most useful data measured here, and that the more substantively relevant finding is that this methodology can be used to measure social support provision—in total, or in terms of support-per-tie—in a way that predicts outcomes. Additionally, this support can be associated with patterns of network indicators in a meaningful way, as will be further discussed in relation to social capital.

Network Interconnectedness

There are mixed findings related to the measures of interconnection used here. Though such indicators reflect the value-added aspect of network analysis that considers factors beyond the dyad-level, it is not clear that measurement of these structural aspects was entirely successful in this case. In the current study, larger networks were less dense, and less density in the network overall and in the core was correlated with a higher proportion of the network or core in SWO, and with more core members in Service roles. Further, density was included as a potential correlate of support provision in bivariate and cluster analyses, and this was not generally reflected in the findings, with the exception of a correlation with concrete support per tie, which is a theoretically expected relationship between network indicators (e.g. Wellman & Wortley, 1990). Network density was associated with stronger and closer ties, and core network density was associated with stronger and longer-lasting ties. Given the mixed findings for reliability of the density indicators, there is reason to think that the current measurement approach accurately captured the degree of interconnection among core ties, but not among all network ties.

There was an observable difference in the degree of interconnection reported by the Hispanic/Latino respondents, who had higher core density compared to all other categories at baseline (and higher network density when compared to Mixed/other). Transitivity, in this case indicating the presence of ties between network members across compositional categories, was also included as a structural predictor of support provision and a correlate of other network measures, and as with network density, findings were minimal and reliability is not indicated. However, as with density, there was a transitivity

finding for Hispanic/Latino respondents, who reported higher baseline transitivity compared to all other groups. (Further, differences in the gain scores reflected this T1 relationship, where core density and network transitivity decreased for Hispanic/Latino participants, compared to all other groups). The findings for the Hispanic/Latino group on the network structural measures may reflect compositional patterns, including the presence of more peer-oriented Family ties with siblings and cousins, and ties between these members in the Family category and members categorized as Friends.

There is theoretical reason to measure and analyze density and transitivity, although the usefulness of these network-level structural indicators depends on the research question and the practical relevance of potential findings. In this case, the density and transitivity measures may be sensitive to other network patterns related to support, such as composition, but these measures of network interconnection were not directly related to support provision in this sample. Additionally, density measures can be misleading when comparing networks of very different sizes (e.g. if a respondent in this study names a three-person network with one tie between two of these members, the density is .33, which is not structurally similar to a larger network with the same density) or when networks have distinct subgroups (Marsden, 1990, citing Friedkin, 1981), as was observed here within the Family and Friends categories (and this may explain why, in some cases, network density was greater than core density, if core ties were less likely to be connected to each other than to non-core ties). Alternatively, future research could use a density measure to indicate the structural presence of a core versus a periphery in these support networks, as there is no standard for how these are defined (Borgatti & Everett,

2000), which allows for some freedom to define these in deference to the practical usefulness of the concept (Kadushin, 2012). Using density to indicate the presence of a core versus a periphery may be a better way to make this network measure of interconnection relevant to research and practice, if these are structural elements that ideally work in combination, as this study suggests.

Regarding how "compositional transitivity" was measured here—as the presence of cross-category triads, as opposed to all triads in a network—the operationalization of the variable may not have matched the research aim. The importance of transitivity in this context is that relationships tend to be uniformly positive in a connected triad (or two of them can be negative, while one is positive; Heider, 1946, cited in Kadushin, 2012). To take this idea further, there are likely many interconnections in these networks that are invisible to the respondent, but serve to support respondent behaviors like service engagement or school attendance. That this kind of "invisible support" may not be perceived by the recipient has been described as the essence of "good parenting, good mentoring, and good friendships, and being a good clinician or social worker" (Bolger, Zuckerman, & Kessler, 2000). Future research will particularly measure the presence and strength of ties between formal and informal roles of interest (e.g. between parent and service provider), as opposed to broadly measuring any triads that cross compositional categories as a structural indicator.[8]

[8] For example, a brief follow-up analysis to explore whether a particular tie could be associated with respondent behaviors showed a mean difference for networks with a tie between anyone in the Family category and anyone in the Other category (where respondents were told to put caseworkers). Results showed differences on average core tie strength (F=5.839, p=.023), and specifically tie frequency (F=4.379, p=047), where these networks had more frequent support and stronger ties, and there was a trend-level association with T2 enrollment (x^2=3.062, p=.098).

Network Change and Stability

Changes in the youth networks over time can be summarized as follows:

- The overall trend is a statistically significant increase in network size measures, tie strength, and both total support and degree of support provision.
- Follow-up networks include 3 more members on average (a 41% expansion over time), and cores increase by less than one member. There are increases for all compositional categories, and a small increase in Parent roles. There is a decrease in Service roles.
- Core ties are getting stronger and providing 10% more support at T2, with the most notable increase in emotional support provided per tie.
- Participants named about three people at T1 that were not named at T2, an average of 3-4 people were named for the first time at T2, and about four people were named at both measurements. 40% of core members were stable over time.

As demonstrated here, change over time can be considered in terms of the stability of network properties, like size and composition, and also the stability of membership over time (Morgan, et al., 1996; Marsden, 1993). Although conclusions cannot be drawn from these exploratory findings, the demonstration of how such stability can be assessed informs future research efforts that may be more specifically designed to capture youth networks before and after service-related transitions or interventions. As a preliminary step towards this aim, the current exploratory findings are discussed in terms of observable trends in the aggregate and by subgroup, and with consideration of the reliability of measurement over time as it was conducted here.

First comparing the network indicators measured over time, the overall trend is an increase in network size—where networks are expanding by 41% (adding 3 members, on average) between baseline and follow-up—and also core tie strength, as well as an increase in total support provision and the "supportiveness" of core ties. These gains are statistically significant for network size, core network size, the number of network members in the Family category, overall tie strength, emotional support provided, and support provided per tie, with provisional trend-level findings for gains in the number of network members in Friends, support frequency, and total support provided. Regarding support specifically, it can be surmised that total support is increasing because core ties are more supportive on average at follow-up (by about 10%), in terms of the degree of support each provides, with a specific increase in emotional support per tie. However, core size increases by about one tie on average, and core density is stable. Within the core composition, there seems to be a slight increase in Parent roles and decrease in Service roles, although these are not statistically significant findings.

It is important to note that most of the participants in this sample were recruited through ILP or school-based service involvement, and most (56%, see Table 5.3) named at least one service-provider as a core tie at follow-up; it can be assumed that these participants are creating new relationships related to ongoing transition service involvement—for example, at least 41% added either a CCS or other formal mentor tie at follow-up (see Table 5.2)—which would explain some of the increase in network size. Nonetheless, it is Family and Friend ties that are most likely to be added to the networks at follow-up, with smaller and non-significant increases in School/Work and Other ties.

Are these network properties stable? Yes and no. Structurally, only network and core size change—there is no detectable change over time for network density and transitivity or network or core diversity, although there is some concern about the reliability of these indicators. There is no significant change over time for core density and for many of the composition variables (with the exception of a statistically significant gain in members categorized as Family), which do seem to show measurement reliability. To address the definition of stability proposed by Morgan and colleagues (1996), there is reproduction of some of the basic structural features of the networks over time, in terms of core density and many of the compositional variables, with no meaningful findings in terms of network density, cross-category transitivity, and network or core diversity.

Is network membership stable? Again, yes and no. Considering all unique ties named at both time points, about 40% of ties are stable between network measurements, and more members are added than subtracted over time. This does reflect a degree of turnover, or member instability, and it is important to assess whether member instability also changes network structure or aggregate features. As Morgan et al. (1996) put it, does member turnover "necessarily imply that the structural and aggregate characteristics of these networks were likewise unstable?" (p.15). In this case, this average degree of membership turnover results in slightly larger core networks providing more support per tie, and therefore more total support provision, although the best case scenario may be for networks with the least turnover. The degree of network-level membership stability was moderately correlated with gains in tie closeness, duration, and strength, and with increased support per tie overall and for concrete and career support, and increased total

informational and concrete support. Nonetheless, in this applied case, the average degree of network "instability" may be desirable; not only are networks generally becoming larger, particularly through gains in members categorized as Family and Friends, but the ties included in the core are becoming more supportive on average.

Recalling that Morgan et al. (1996) identified two sources of stability in networks that prevent member turnover from changing network-level properties over time, it seems that these sources are both somewhat observable here. In this sample, there is a set of stable ties anchoring network composition over time, and these ties are closer and of longer duration, compared to ties that appear at only one measurement, and they are specifically stronger overall compared to ties mentioned at T1 only. Importantly, stable ties had higher levels of multiplexity compared to T1-only and T2-only ties, in terms of providing more support types per tie on average; follow-up logistic regression shows that this multiplexity measure is the best predictor of tie stability. On the other hand, stable ties were less likely to provide emotional support in all domains, compared to T2-only ties, and more likely to provide concrete support compared to T1-only ties; therefore, ties being retained are providing more varied concrete support specifically, and ties being added at T2 are providing more varied emotional support. Stable ties are most likely to be parent figures (compared to service-oriented or other ties), and these ties tended to be stronger overall (specifically closer and longer-lasting) compared to all other ties, and although this finding is not statistically significant, they provide concrete support in more domains than non-parent roles.

This observation reflects what is known about parent-child ties in personal networks, which tend to be more stable and supportive across the board, with the exception of companionship, which is usually provided by friends (e.g., Schweizer, et al., 1998; Wellman & Wortley, 1989, 1990). Further, there are significantly more stable ties than expected in the Family category and fewer than expected in the Friends category, and Friend ties are more likely to be T2-only ties. These findings are comparable to the Whitbeck and Hoyt (1999) study of homeless and runaway youth supports, which found that friends provided emotional support and that relatives (not parents) provided instrumental or concrete support. Considering the number of relatives that would have been included as Family in this study (see Table 5.3), it is likely that relatives are also providing much of the stable concrete support reported in this study. These are expected network findings regarding the stability of family-based ties and concrete support provision (Morgan, et al. 1997; Schweizer, et al., 1998; Wellman, et al. 1997; Wellman & Wortley, 1990), which is a critical consideration in child welfare research and practice.

In addition to observing a set of stable core ties providing dependable support, there is also enough membership fluidity to observe the formation of new supportive relationships. For example, compared to family-based ties, Friend and School/Work/Other ties are more likely to appear at T2-only, and these may be the "relatively interchangeable" (Morgan, et al., 1996) ties that exist in a network periphery and are "sampled" in personal network measurement as providing support at any given time point. In this sample, the finding that core Friend ties are more likely to be added at T2 may reflect the growing independence of respondents to create the peer and romantic

attachments that are developmentally appropriate for this age group (Degenne & Lebeaux, 2005; Furman & Buhrmester, 1992). This reintroduces the idea of homophily, or the tendency for networks to develop a dense core of ties to others with similar attributes and norms (e.g. Louch, 2000; McPherson, et al., 2001). Arguably, homophily is a placement goal, in terms of policy and practice, in that children and youth are ideally placed in homes with kin or in non-kin placements that reflect the family and culture of origin as much as possible. However, in cases where this is not possible, placement may hinder network development by limiting opportunities for older youth to be embedded in homophilous networks (e.g., a youth placed in a non-kin foster home with different religious beliefs or cultural traditions). Additionally, child welfare intervention may limit normative peer relationship development, if friendships are disrupted by school or placement changes. Though this study provides no evidence of this network mechanism at work, the finding that new ties appearing at follow-up are more likely to be friends and/or emotionally-supportive suggests that this is a concept that could be further explored using this methodology.

Another way to highlight the importance of these friend and/or emotionally supportive ties is the idea of companionship—usually provided by friends (Schweizer, et al., 1998; Wellman & Wortley, 1990)—as a distinct contributor to personal well-being, separate from social support (Rook, 1987). The influence of companionship is based on the perception of oneself as likable and able to find company for stress-buffering leisure activities in a way that is doesn't involve the "helper-helpee exchanges . . . that may mute the esteem-enhancing benefits of social support" (Rook, 1987, p. 1145). This study did

not measure well-being or companionship, but this may partly explain the higher emotional support provided by friend and/or new core ties, recalling that this support was indicated by regularly talking to people (within the various life domains).

On the other hand, T1-only ties are weakest across the board (with the exception of tie duration ratings, which are predictably shorter for T2-only ties) and they provide the least support by type or domain (with the exception of emotional support, which is lower for stable ties). This is comparable to previous research showing that stable ties tend to be multi-dimensional, in that the "content multiplexity" (Beggs, Hurlbert, & Haines, 1996) measured here considers the breadth of interaction in terms of multiple kinds of supportive content provided in relationships. The T1-only ties are most likely to be Service roles, and the end of a service-oriented relationship was the most common reason respondents gave for tie decay between T1 and T2. At the tie-level, service-providing ties are less close, of shorter duration, and provide support less often compared to Parent roles and other ties, though these relationships are more supportive as providers of information and guidance in multiple domains. On the other hand, 35% of service-providing relationships are stable over time, which is more than other non-parent ties (of which 31% are stable). The association of service roles with transitory T1-ties is likely because this was the only role or compositional category where fewer core ties were added at T2 than were lost at T1.

Tie-level stability indicators seemed fruitful in this demonstration, and provide confirmatory characterizations of some expected relational qualities. As with the categorization of members as family, there is not any distinction here between foster

parent roles versus parent figures from families of origin, which may or may not differ in relational quality or support provision. Potential differences between stability at the network- and tie-level by foster versus biological family membership warrant further analysis. There may also be important tie-level differences by type of service-providing relationship— which was broadly defined here—in terms of child welfare service-oriented relationships versus school-based staff, which encourages more distinction of these roles in future research.

Social Capital

Social capital is considered here as an emergent network property that is not specifically measured but rather provides a conceptual frame for summarizing and understanding differences in the network profiles produced by the cluster analysis. These clusters were described in social capital terms that echo the sources of network stability that are identified by Morgan et al. (1996). As observed here, the profiles are marked by combinations of features indicating the presence of some strong and stable ties providing dependable and broad support and/or more peripheral, transitory ties providing less support but increasing the network indicators of compositional diversity (which, like large networks and low density, are ways to indicate network "range", depending on what you're trying to explain; Campbell, Marsden, & Hurlbert, 1986; Marsden, 1990). Noting again that although size is the variable most influencing the clusters, there are differences in how combinations of ties contribute to total support, as seen in the comparison of high-support Cluster B ("more bonding than bridging") and Cluster C ("more bridging than bonding"), which rely differently on family-based and service-oriented ties, as well as

low-support Cluster A ("bonding, not bridging") and Cluster D ("bridging, not bonding"), which rely differently on a few non-service ties. The distinctions between the clusters are described in the findings in terms of social capital, and these can be further highlighted in terms of membership stability, which can be synthesized with social capital here.

First, looking at the high-support (per tie and in total) profiles distinguished by observable features of both bonding and bridging social capital, these two clusters (59% of sample) include nearly all of the participants living in foster care at T1 (86%) and T2 (88%), which is separately associated with larger networks and both high turnover and stable ties. Both these clusters have many stable members and higher average stability (not statistically significant) and maintain the largest networks and highest support over time. Participants in these clusters are specifically not likely to be living independently at follow-up, and very few report a change in living situation between T1 and T2. These clusters seem to represent the most diverse and dynamic network membership—including service-providing ties and friendships—anchored by a family-based stable core network.

On the other hand, among the two low-support clusters (41% of sample), the bonding capital in family-based Cluster A is associated as expected with high average stability over time in terms of the proportion of all ties that are stable, and this cluster adds the fewest members at T2 and has the fewest core members overall on average. Participants assigned to this cluster based on their T1 network properties seem to maintain core stability through a few strong ties, and indeed they have the most supportive relationships in terms of support per tie, but this is not fully balanced with a sampling of transitory peripheral ties. At the other end of the spectrum, Cluster D has

some indicators of bridging social capital (compositional diversity and service-providing relationships are comparable to high-support Cluster B) and minimal indication of bonding capital, and this cluster also has the lowest core stability over time and the fewest stable members overall. This group is likely living independently at follow-up, and not with biological or foster family members, and this cluster accounts for 60% of the living situation changes reported between T1 and T2, which is another indicator of instability. This cluster seems to have networks largely composed of transitory ties that are school- and work-oriented or service-providing, and therefore less likely to provide multi-dimensional or stable support over time.

The cluster profiles seem to be best described by composition, and it may be helpful to consider this at the tie level to understand how these member category and role indicators are associated with support and stability. One of the notable threads throughout the findings is the contrast of the Parent and Service roles, as conceived here. At T1, the number of core Parent roles had a medium correlation with support provision in total and for all three support types. At the tie-level, relationships with core members in Parent roles tended to be closer, last longer, and were stronger overall on average, compared to Service roles and all other ties. Although the comparisons were not statistically significant, Parent roles provide concrete support in more domains on average than non-parent roles. In comparison, the number of baseline Service roles was associated only with academic support, and with networks with weaker ties on average. At the tie-level, service-providing ties are less close, of shorter duration, and provide support less often compared to Parent roles and other ties, though these relationships are more supportive in

terms of providing information and guidance in multiple domains. These tie-level patterns are also observable for the broader categories of Family versus School/Work/Other ties. If the Family category, and Parent roles in particular, and the SWO category, and Service roles in particular, can be considered proxies for bonding and bridging capital, then we can see how these ties are important cluster characteristics.

The patterns observed here are not necessarily surprising. For example, it would be hoped that service-oriented ties would provide bridging capital, as these roles—specifically, the ILP case managers and child welfare caseworkers—are literally service brokers linking participants to resources in other networks. Although in practice, these relationships often have an element of personal closeness that is presumed to be beneficial for the provision of support to transitioning youth as the client, strong relationship development is not necessarily the practice goal. The finding that these relationships are often named as core ties specifically providing informational support is welcome, and although actual service provision is not measured here, the presence of these weaker service-oriented ties in the core may indicate effective bridging capital in the clusters. Networks classified as having more of these relationships also report a wider breadth of support, which may be the result of these ties providing informational support that youth are not otherwise receiving from family and friend ties. In this sample, this suggests that service-oriented ties are providing bridging capital as hoped, by connecting youth to institutions and brokering information (Burt, 1992; Granovetter, 1973).

On the other hand, family-based ties, including kin and foster family members classified as family by the youth, are on average providing more support across type and

domain as expected. It may be that tie strength as operationalized here is overestimating the strength of kin ties based on duration, or overestimating the strength of every day ties by frequency (Marsden & Campbell, 1984). However, the consistent group differences by closeness reflect differences in "closeness" however this was defined by each respondent, which may be the best indicator of the bonding capital provided through these ties. In this case, the lack of distinction between foster and biological family members providing support is heartening, in that both of these are providing bonding capital as hoped, which is a desired outcome of child welfare intervention.

In this study, social capital indicators might be the best way to understand what kinds of social mechanisms may be missing from networks providing relatively less or more narrow support. For example, the second largest profile (Cluster D) is associated with the lowest support, with some service-providing roles and representation of members from SWO. Perhaps the facilitation of more support could come from an understanding among service providers that this particular youth network is not anchored by a family-based core closely monitoring needs. An ILP case manager, for example, could take on a more active role facilitating communication between service providers to monitor and meet youth needs, or may help youth focus on developing (or reconnecting with) long-term informal support relationships. That is not to imply that this does not already regularly happen in practice as a function of good case management, recalling the "invisible support" mechanism, but there is benefit in understanding the prevalence of these particular kinds of youth network structures and how such service-related activities might increase bonding social capital.

Alternatively, in Cluster A multi-dimensional support is provided by a few close ties, but support provision overall is relatively weak and bridging capital is not indicated. Perhaps these dense family-based networks are resistant to service-providers, or perhaps there is an opportunity to more strategically develop transitive ties between service-providers and core family members to encourage youth engagement and success in services or education. Such variation in potential intervention approaches based on network indicators has been discussed with other populations (e.g. Pinto, 2006; Tracy et al., 2012), but there is mixed evidence that social networks can be intervened on in a traditional service-oriented sense to increase social support (Hogan, Linden, & Najarian, 2002). The argument here is that any such attempts should be preceded by a comprehensive understanding of youth support network form, content, and stability, to begin an informed discussion about how services may be better-adapted toward existing support network structures, within which formal service-providing relationships operate in the context of both stable and transitory informal support ties.

Practice Implications

This study is intended to evaluate this methodology as a research approach, but also to assess whether observable findings are useful from a practice perspective, in terms of understanding how network-based patterns of support provision may affect youth outcomes. There a few findings that can be discussed in practice context. The first is that the majority of these service-connected, high-functioning youth report having networks that provide multi-dimensional formal and informal support, indicate bonding and

bridging social capital, and show member stability over time. This confirms the achievement of important practice goals related to support for transition-age foster youth.

Specifically, youth living with foster family tend to have the highest support profiles in this study; that is not to say that foster care is preferable to living with biological family, but that living with foster family increases multi-dimensional support capacity, most likely because these youth are tied to a family structure that is connected to various service providers, plus they may also have informal ties to biological family supports. On the other hand, there does seem to be a distinction between family-based living situations, whether biological or foster, and independent living situations, whether youth are living alone or with roommates or romantic partners. These networks are smaller, less diverse, and provide less support overall, but they also have low turnover. This may indicate that the transition from family-based situations decreases support in ways that may be preventable through network assessment prior to these transitions.

This study demonstrates the feasibility of using the network instrument in research, and practice applications for support assessment could employ similar approaches. In addition to assessing youth transition readiness in terms of skills and resources, support provision could be measured for life domains of specific interest in the practice context (e.g. housing, work, education). As with the study here, the goal would be to assess support currently being provided by core ties. For practitioners interested in network change over time, the gain score analysis reported for Research Question II is a straightforward and easily-interpretable way to quantify support stability in the practice context. To do this, values for selected network properties could be measured at a follow-

up and simply subtracted from the baseline measurement to quantify positive or negative change in these indicators. This could capture, for example, increasing or decreasing network size, support per tie, or total support over time. Although the protocol reported here took 30-45 minutes, simpler assessments in practice settings could take less time.

In addition to quantitatively assessing network size and support provision in practice, this methodology can be applied to qualitatively assess transition readiness by evaluating the support environment, especially if youth are moving out of family-based situations to live on their own, and especially if they will no longer be receiving child welfare services. Personal networks assessment can reveal the nature of current youth relationships, in terms of supportiveness, strength, interconnectedness, and broadly, whether youth are comfortable seeking help from their networks. In this practice context, example qualitative support network assessment questions might include:

- Are there family-based connections that will likely be maintained?
- Does ongoing service provision rely on the caseworker, ILP case manager, or foster parent as a connecting tie (encouraging or helping youth continue services), or are informal supports and/or the youth comfortable seeking ongoing services?
- Are there informal support members providing multiple kinds of support, increasing the likelihood that these will be stable ties? Are there family members providing concrete support? Do any informal ties provide informational support?
- Is there compositional diversity in the network? Ties from different social spheres? Parent figures? Service providers? Friends?

- If networks are assessed multiple times, are ties stable? If there is a lot of member turnover, are these members being replaced by people offering as much support?

This kind of qualitative network assessment can give practitioners and youth new ways to talk about the different kinds of support people get through various relationships, and how these contribute to well-being in different ways (e.g., Do youth feel they have enough companionship? Mentoring? Someone to call in an emergency?).

Qualitative support network assessment also reveals areas of transition readiness for practitioners to focus on, whether this is to increase diversity, encourage new connections, or engage youth in discussions about relationship-building, including potential reconnections with family members. More specifically, this is a way for child welfare case workers and ILP case managers to target pre-transition case efforts with the goal of minimizing network disruption when these service-providers leave the network as part of the youth transition from foster care. One approach might be engaging existing support network members and facilitating new formal and informal connections to strengthen network stability overall and better connect youth to ongoing transition services. For example, in addition to (or instead of) encouraging a youth to take a basic cooking class in preparation for independent living, an ILP case manager could coach a youth to engage an aunt or community member to set up ongoing one-on-one cooking lessons. This promotes the development of a multi-dimensional informal mentoring relationship that would be more likely to last through the youth transition into adulthood, and gives youth experience in help-seeking and developing mentoring relationships. Similarly, practitioners can coach informal support network members on the importance

of maintaining ties to ongoing service-providers during transition. For example, a caseworker might meet with a youth and her grandmother to explain how to access the college-based services and financial resources available to former foster youth. By explaining to the grandmother how these services are accessed, and perhaps connecting the grandmother directly to the school-based service provider, the case worker helps youth take advantage of the existing bonding tie to encourage the development and maintenance of a new bridging tie. These are examples of how formal support providers can interact with youth and existing network members to identify strengths and gaps in the network, facilitate more multi-dimensional (multiplex) relationships, and encourage formal and informal network members to maintain ties to each other in the absence of a worker providing case management after youth exit the foster care system.

Lastly, network assessment can potentially help agencies locate youth who have fallen out of contact if they have a map of the youth's support providers. For example, if the most recent phone number a practitioner has for a youth is an older sister, but this number is out of service, consulting the network map might show that the youth and the sister are both connected to a former foster parent who can be easily reached. This may be especially useful given the federal mandate (as part of the John H. Chafee Foster Care Independence Program) requiring states to gather longitudinal data on the outcomes experienced by youth who age out of foster care, for the purpose of establishing a National Youth in Transition Database (NYTD). Successfully locating youth for outcome assessment after they have exited the system is part of the mandate, and there are fiscal penalties for states that do not meet youth participation requirements.

Study Limitations and Research Implications

Limitations of Study

Limitations of Research Design. This study explores patterns of support in the social networks of service-engaged youth with foster care experience transitioning into and through post-secondary educational and training programs. The design of the program evaluation from which this participant sample was drawn allows for analysis based on the inclusion of a non-equivalent comparison group that did not receive the program intervention, but this study does not include any comparison of these groups. No causal conclusions are drawn from any changes in the youth networks that are associated with participation in this or any other mentoring intervention, nor is causality inferred regarding other individual-level predictors (e.g. living situation).

The exploratory nature of this study introduces a considerable risk of Type I error, due to the number of variables analyzed and the breadth of analytic approaches used. The research questions reflect a broad interest in determining whether personal network concepts can be reliability measured in this sample, and whether the network instrument used here has construct validity, as far as meaningfully capturing theoretical network concepts that may guide future explanatory research with this population. Therefore, this is a preliminary attempt to observe and evaluate theoretically explainable patterns of network structure, composition, relational characteristics, and support provision, while remaining cognizant of the likelihood that some findings are the result of Type I error.

An additional limitation regards more sophisticated statistical analysis of the tie-level variables. Recent personal network research has incorporated multi-level models to

account for the interdependence of ties nested within networks, allowing for contingent analysis of particular associations within networks with particular properties (e.g., are parent-child ties stronger in networks with more parent-child ties overall?) (Wellman & Frank, 2001). Previous network approaches accounted for the interdependence of ties by calculating network-level properties (e.g., in this study, composition is analyzed as both the total network members in a category, as well as categorical distribution expressed as a proportion of all ties). The development of a multi-level model would allow for analysis of all ties within the networks and would serve as a logical follow-up to exploratory findings from this study, albeit with a larger sample size and an a priori hypothesis to determine model levels (e.g. is there an interest in modeling tie-level relationships within network "types"?). However, although multi-level models are innovative, direct comparison of single- and multi-level analysis of the same network data have "confirmed the robustness" of the approach used here (Wellman & Frank, 2001, p. 247).

Limitations of Sample Size. Although the sample size may raise concern regarding statistical power for network-level analyses, bivariate and multivariate tests indicate multiple medium to large effect sizes are detectable in this sample at T1 (n=34 networks) and T2 (n=27) at both $p<.05$ and $p<.01$. In recognition of the small sample size, non-parametric statistical tests were employed in many cases as a form of sensitivity analysis.

Limitations of Generalizability. This study uses evaluation data from a mentoring program for transition-age youth with foster care experience who are enrolled in post-secondary education and training programs. Although participants were recruited through college programs serving youth with foster care experience, most were referred by the

Independent Living Program, which is itself a referral-only service for older youth in care. Thus, this is a convenience sample that is not generalizable to all transition-age youth in foster care, but is somewhat generalizable to those attending college and/or receiving ILP services. Because most youth in care do not receive ILP services (e.g. Courtney, et al., 2005), and because it is less common for youth with foster care experience to enroll in (or complete) post-secondary programs (Casey Family Programs, 2006, 2008; National Working Group on Foster Care and Education, 2007), the participation of these students in the CCS mentoring program may reflect exceptional levels of formal and/or informal support available in their networks, relative to other transition-age youth with foster care experience. Additionally, there may be individual differences related to a willingness to participate in a mentoring program (or for the comparison group, participate in the data collection for the program evaluation), that could be associated with support network indicators. For example, studies have shown that personality factors like agreeableness and openness to new experience, as well as a positive attitude towards help-seeking, are associated with the decision to participate in a mentoring program for students transitioning to college and planning to major in the sciences (Larose, Cyrenne, Garceau, Harvey, Guay, & Deschenes, 2009). However, network-based mechanisms are assumed to operate in different combinations in any population, and the discovery of network predictors in this population—for example, significant findings associated with the presence of service-providing roles in the youth networks—could inform research with other youth transitioning from foster care and other youth populations eligible for social services.

Limitations of Data Collection and Measures. Though network literature details the challenges of collecting data (e.g., Marsden, 2005; Wellman, 2007), including known reliability issues (Brewer, 2000; Kogovsek & Ferligoj, 2004, 2005; Marsden, 1990, 2005; Tracy et al., 1990; Wasserman & Faust, 1994), standard survey methodology is considered a reasonably reliable way to collect data from respondents about the structure and composition of their personal networks (Marsden, 1990). On the other hand, there is some agreement that name-generating network instruments can only capture a sampling of the actual personal network at each measurement (Walker, et al., 1993), with members who are named on multiple occasions representative of a stable core network and more transitory ties representing a sampling from the periphery (Morgan, et al., 1996). An alternative approach would be to similarly measure youth networks over a shorter period of time (e.g., 3 months) to capture core-versus-periphery in terms of stable versus transient ties (Morgan, et al., 1996). This is in line with recommendations to increase reliability by measuring networks more than once to get a stable network "snapshot" (Marsden, 1990; Tracy, et al., 2012). Specifically, Tracy and colleagues (2012) recommend that "when examining the social support of clients, it is important that social workers recognize that multiple measurements of these characteristics may be needed to get a stable picture of actual support resources" (p. 36), especially when network-based support may or may not be sensitive to intervention.

Regarding more specific reliability threats, there is a risk of measurement error due to a testing effect, as participants were more familiar with the measure at follow-up, which may have made it easier to generate names of network members. Similarly,

familiarity with the instrument on the part of the author, as well as protocol improvements between time points, likely improved reliable administration of the measure at follow-up. Additionally, there was inconsistency in the protocol for exploring the presence or absence of ties at follow-up, in that respondents were able to amend the T2 network if they wished after being reminded of a forgotten tie, but were not given the opportunity to amend the T1 networks retrospectively when asked about a new T2 tie. Any of these measurement issues could have introduced error that weakens the import of some of the findings, particularly the conclusion that networks were larger at follow-up.

There are also measurement concerns related to the program domains (*academic support*, *career prep*, *extracurricular*, and *social support*) included on the network instrument. These were included as part of the program evaluation to assess particular support domains of interest to the mentoring intervention, but data were collected from both intervention and comparison group participants, and both groups expressed some confusion regarding the definition of the extracurricular and social support domains. The academic and career domains were more easily interpretable, and of particular interest here, so these are specifically included in analyses. However, the support totals include all four domains, which may introduce measurement error.

There are also particular reliability concerns around asking respondents to report on the presence of ties between their network members. This is a common choice in personal network research (Marsden, 2005; Wellman, 2007)—and a recent study with homeless and runaway youth of comparable age also used a "map" to generate names and then asked who in the network "likely knew" each other (Rice et al., 2011)—but is

nonetheless a limitation that inarguably introduces reliability concerns. Ideally, measurement includes confirmation of any inter-relationships between identified network members with those members directly (this is also a way to implement sensitive relationship reciprocity measures), or alternatively, one can interview a few members that know the network well (Campbell & Lee, 1991; McCarty, 2002). Future research efforts will attempt to build in some confirmation of youth-identified network content and structure to improve reliability. Potential reliability concerns with the density measurement conducted here are discussed in the findings for Research Question III.

In this case, there is also a social desirability risk regarding how many network members are named and how those relationships are characterized. Efforts were made to assuage any impression that there is a normative support network that respondents should try to emulate, but social desirability is nonetheless a concern. On the other hand, there are specific reliability concerns around the accurate reporting of some relevant relationships that may not be sanctioned by the child welfare system. For example, youth may be hesitant to report that they have independently reconnected with a biological parent who lost custodial rights, or may not accurately report on relationships when there is a history of interpersonal conflict or criminal behavior, if they are under the impression this kind of information may be reported to a caseworker. Mandatory reporting was not directly addressed in the informed consent process, as there were no data collected related to maltreatment or foster care history; this may or may not have influenced youth responses regarding their social networks. There were no instances of youth providing information covered by mandatory reporting requirements.

Lastly, although respondents were discouraged from providing any personal or identifying information in the network data collection, there are nonetheless legitimate confidentiality concerns around raw network data that may include the names of identified network members (Kadushin, 2005, 2012). In this case, any network data that included member information beyond first names or initials were blacked out, and youth are identified by initials or code numbers only. Such standard identity protections in data collection and storage can ensure confidentiality, but any risk to the privacy of youth and families involved in child welfare systems is an ongoing ethical consideration.

Research Implications

One of the primary purposes of this study was to test the usefulness of the network instrument used here, in terms of reliability and validity, and to test the different analytical approaches attempted here, in terms of observable relationships that might inform child welfare practice. As reported in the results for Research Question III, the different approaches used test the measurement reliability of the network indicators have mixed results. The following methodological conclusions are drawn:

- Documentation of forgotten core ties suggests that the reported changes in the network variables over time likely reflect actual changes in the participant support networks, as opposed to reflecting measurement error due to recall problems.
- Bivariate analyses indicate the following indicators are reasonably reliable: network and core size, core density, tie strength, indicators of the number of Parent and Service roles in the core, all of the total support variables, and degree of emotional support.

- Reliability is generally not indicated for network density or transitivity, compositional indicators (by category or diversity), tie closeness, or most degree of support measures.
- The tests of construct validity confirm the support capacity (network size) and compositional diversity traits, but again, categorical distribution does not show validity.
- Convergent construct validity is demonstrated between the network-based measure of enacted social support and a more traditional standardized measure of perceived social support (MOS). Additionally, this support measure is a better predictor of an outcome, post-secondary retention, with this population.

Overall, preliminary tests show that the network instrument, as administered with this sample, is reasonably reliable and a degree of validity is demonstrated. Exceptions to this conclusion are addressed in the following proposed research implications (Table 5.19), which also address some of the less successful analytic approaches used here and the overall study limitations detailed in the previous discussion section.

Table 5.19. *Research implications*

	Current Study	Future Research
Measurement and Analytical Issues	Measures network density and core density	The network density measure is not reliable and may not be theoretically useful, compared to core density; measure core density only, or exclude network density from analysis
	Measures cross-category transitivity	Do not measure transitivity this way; instead measure the presence of particular connections of interest (e.g. between formal and informal support network members)
	Includes race/ethnicity as predictor of network indicators, including support provided	Use race/ethnicity as covariate with service availability and client engagement in networks; do not use race/ethnicity as a predictor for network variables without a specific hypothesis
	Includes living situation as predictor of network indicators, including support provided	Define living situation more carefully to clarify formal versus informal support; consider family-based (foster or biological) versus independent living situations; explore concepts like permanency in networks, as associated with living situation; do not use living situation as a predictor for network variables without a specific hypothesis
	Measures network-based support within program domains	Use network-based support to predict outcomes; consider standardizing transition-program domains (e.g., career, education, housing) to improve measurement and broaden applicability of network instrument in practice
	Measures network change and member stability	Measure networks in a similar manner over a shorter period of time to establish support network members; consider using stable versus unstable ties to define core versus periphery; consider program evaluation applications (e.g., use gain scores to test differential intervention efficacy); consider practical applications to assess client support; expand the qualitative analysis of tie turnover; expand the application of tie-level analysis
	Measures network member composition by broad categories	Use similar categories (or alternatively, the social role list) to generate names for the network, but do not use categorical distribution in analysis; instead, define specific roles of interest (e.g., parent versus service roles)
Other Study Limitations	Research design (uses program evaluation data, exploratory)	Use a larger sample to measure intervention effects on networks indicators over time (e.g. gain scores by intervention group), or use a cross-sectional design with a larger sample; if theoretically justifiable, use a multi-level design; narrow down variables and analyses based on this study to develop specific hypotheses reduce Type I error
	Limitations of generalizability	Sample from a more generalizable population, or develop hypotheses regarding high-functioning or service-connected subgroups

Social Work Implications

In social work practice, the person-in-environment perspective recognizes that client outcomes are influenced by social context at the interpersonal level and beyond. Efforts to account for interpersonal support processes facilitating client well-being are often limited to individual-level perception of available social support by type. Further, although the assessment of network composition is somewhat established in social work—recent examples include Tracy and Johnson (2007) and Tucker and colleagues (2009)—studies tend to rely on individual and dyad-level measures. Additionally, although the field of social work is explicitly concerned with social service interventions, research has not yet systematically addressed the form and content of service-providing relationships in the context of other support ties. To do this, the network perspective can situate service-related phenomena—such as service engagement or client outcomes—in the wider network of personal and service relationships within which clients are embedded. The systematic measurement of these networks can help account for the role of social service workers in overall resource and support provision, based on measurable interaction with, and between, clients and other personal and service network members. Further, this approach could be a powerful practice-oriented accountability tool for assessing the impact of social service workers in the network from the client perspective. Potentially, service agencies could directly influence practice efforts if caseworker performance assessment included evaluation of whether practitioners were identified as support providers in client networks in ways that reflect service objectives and client needs (e.g., what kinds of support are clients reporting receiving, and how often?).

For example, in this study, it is demonstrated that the formal service-providing relationships measured here—most of which are child welfare service-related or college-based—may be critical weak ties increasing compositional diversity in networks and providing bridging social capital through informational support provision, especially where informal friend and family-based ties are less likely to provide informational support. Comparatively, service-oriented ties are not shown in this sample to be providing the close and multi-dimensional support provided by parent figures. Additionally, the presence of service roles is negatively associated with strong ties and dense, family-based networks, which may be more prevalent among the minority youth in this sample. This may have policy implications if it can be determined whether there is an unmet youth service need due to lack of service access, or alternatively, whether these close-knit networks are capably providing any necessary social support in a way that can be emulated in youth networks that lack these strong family-based ties.

The incorporation of this kind of social network perspective may be a way to frame new research questions relevant to social work practice, conceptually link micro- and macro-processes influencing social service provision and utilization, and theoretically ground individual behaviors in social context. Further, it has been argued that child welfare research is under-informed by mainstream social science theory (Berridge, 2007; Stein, 2006b). The network theoretical concepts used here are long-established in social science, and have specifically been used to explain how network characteristics influence, and are influenced by, individual youth experiences in the transition to adulthood (e.g., Bidart & Lavenu, 2005; Degenne & Lebeaux, 2005). This

study is a small step in a larger agenda to use social network concepts to explain how long-term foster care placement may alter the development of a normative support network with the capacity to guide youth into young adulthood. Although the current study is a preliminary step in applying network methods with this population, it also demonstrates how such methodology can be used in the evaluation of other interventions dependent on client relationships with a service provider. Future findings may inform policy related to formal transition support provision for youth with foster care experience, and may also contribute to network-informed practice models illustrating how social network processes—for example, the presence of dense cores with stable network membership, or indicators of diverse ties providing bridging capital—influence overall support provision to youth during the transition from other public service systems.

Additionally, the application of network methods with this population has implications for the field of social network analysis and social science more broadly. First, this approach draws attention to the applicability of network theory in research with vulnerable populations who may be expected to have networks with limited support and resources. Concepts like social capital are not relevant to social work practice if they are tautological (i.e., "the successful succeed"; Portes, 1998, p. 5); this tautology is observed in the current study with the finding that youth who are able to name more supportive people in their networks also report more total support. An attempt was made here to adapt standard measurement approaches to capture different kinds of support mechanisms for youth with unconventional family structures or unstable living situations. For example, support and tie strength were specifically measured to capture small but

supportive networks of strong and multiplex ties, where bridging capital might be called for, as well as small and less supportive networks of weak ties, where the bonding capital available through multiplex close ties may be lacking. This demonstrates how broad network concepts can be applied to a specific social work population without losing the theoretical grounding the network research paradigm provides.

Additionally, attention to the support networks of vulnerable populations like youth in foster care offers the opportunity to understand state-mandated transitions into, out of, and between service-oriented organizations and institutions from the client perspective; for example, the study of the short-term and long-term impact of child welfare intervention on the personal network structure (and composition and support content) of children, youth, or parents would inform comparable research with juvenile or adult justice populations. This kind of research would address how individual agents of institutions are represented in client networks, and whether patterns of support provision reflect organizational service objectives. Similar to established models of network-based service-usage strategies (e.g., Pescosolido, 1992), this approach considers client help-seeking and service use as limited by the perceived availability of support or resources embedded in the social network. This study is a first step towards applying this perspective to vulnerable social work populations with limited support and resources, to address how this kind of institutional involvement impacts personal networks and support provision before, during, and after intervention. Ultimately, such research will also be able to address how organizational-level factors influence support provision from the client perspective at the personal network level.

Conclusion

An imperative of social work research is practical relevance, which is why this study is framed as exploratory and preliminary, and does not draw conclusions based on a small sample and an untried methodology. Rather, the current study demonstrates how network methodology can be used to distinguish the amount and variability of formal and informal sources of social support among youth transitioning out of foster care, in this case a subgroup of potentially higher-functioning youth involved in post-secondary education and likely also receiving referral-only transition services. Further, this small-scale effort demonstrates a repeatable way to gather a great deal of reasonably reliable multi-dimensional social network data in the time it takes to complete an average program evaluation survey; repeating network measurement over time easily widens the investigative scope to allow for additional consideration of network stability and member turnover.

On a broader scale, this systematic measurement of personal networks can be used to explore assumptions about the amount and variability of formal and informal support available before and after the transition from care, with the added descriptive power provided by network-oriented theoretical mechanisms presumed to be influencing support provision. For example, it is valuable to understand how dense network cores may provide normative multi-dimensional day-to-day support for older adolescents, but also how a sparse periphery may be a critical structural element increasing the breadth of support by type and domain, especially when these potentially disconnected spheres of support are not often assessed as both distinct and interactive.

Arguably, such a methodology could be employed to explore the network effects of foster placement itself as a structured intervention to provide this cohesive core, where such multi-dimensional support may be lacking in the social context of origin; importantly, this core likely depends on a periphery of both weaker service-oriented ties as well as established informal ties to provide comprehensive support. If such network mechanisms can be assessed among this population, potentially rich predictions can be made about network stability and ongoing support as youth transition out of more structured service environments and into young adulthood. It is hoped that this study can make a contribution to such future research efforts.

References

Agneessens, F., Waege, H., & Lievens, J. (2006). Diversity in social support by role relations: A typology. *Social Networks, 28*(4), 427-441.

Ahrens, K. R., DuBois, D. L., Garrison, M., Spencer, R., Richardson, L. P., and Lozano, P. (2011). Qualitative exploration of relationships with important non-parental adults in the lives of youth in foster care. *Children and Youth Services Review, 33*(6), 1012-1023.

Avery, R. J., & Freundlich, M. (2009). You're all grown up now: Termination of foster care support at age 18. *Journal of Adolescence, 32*(2), 247-257.

Barrera, M. (1986). Distinctions between social support concepts and measures. *American Journal of Community Psychology, 14*(4), 413-445.

Barrera, M., Sandler, I.N., & Ramsay, T. B. (1981). Primary development of a scale of social support: Studies on college students. *American Journal of Community Psychology, 9*(4), 435-447.

Beggs, J. J., Hurlbert, J. S., & Haines, V. A. (1996). Revisting the rural-urban contrast: Personal networks in nonmetropolitan and metropolitan settings. *Rural Sociology, 61*(3), 407-426

Berridge, D. (2007). Theory and explanation in child welfare: education and looked after children. *Child and Family Social Work, 12*(1), 1-10.

Berzin, S. C. (2008). Difficulties in the transition to adulthood: Using propensity scoring to understand what makes foster youth vulnerable. *Social Service Review, 82*(2), 171-196.

Bidart, C., & Lavenu, D. (2005). Evolutions of personal networks and life events. *Social Networks, 27(*4), 359-376.

Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology, 79*(6), 953-961.

Borgatti, S. P. (2000). Netdraw Network Visualization. Harvard, MA: Analytic Technologies.

Borgatti, S. P., & Everett, M. G. (2000). Models of core/periphery structures. *Social Networks, 24*(1), 375-395.

Borgatti, S. P., Everett, M. G. and Freeman, L. C. (2002). UCINET for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.

Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *Science, 323*(5916), 892-895.

Brewer, D. D. (2000). Forgetting in the recall-based elicitation of personal and social networks. *Social Networks*,*22*(1), 29-43.

Burt, R. S. (1980). Models of network structure. *Annual Review of Sociology, 6*(1), 79-141.

Burt, R. S. (1992). *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56*(2), 81-105.

Campbell, K. E., & Lee, B. A. (1991). Name generators in surveys of personal networks. *Social Networks, 13*(3), 203-221.

Campbell, K. E., Marsden, P. V., & Hurlbert, J. S. (1986). Social resources and socioeconomic status. *Social Networks, 8*(1), 97-117.

Carrington, P. J., Scott, J., & Wasserman, S. (eds.) (2005). *Models and Methods in Social Network Analysis*. New York : Cambridge University Press.

Casey Family Programs. (2006). *It's my life: Postsecondary education and training.* Seattle, WA: Author.

Casey Family Programs. (2008). *Supporting success: Improving higher education outcomes for students from foster care*. Seattle, WA: Author.

Cashmore, J., & Paxman, M. (2006). Predicting after-care outcomes: the importance of 'felt' security. *Child & Family Social Work, 11*(3), 232-241.

Coleman, J. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94*(S1), S95-S120.

Collins, M. E. (2004). Enhancing services to youths leaving foster care: Analysis of recent legislation and its potential impact. *Children and Youth Services Review, 26*(11), 1051-1065.

Collins, M. E., Paris, R.., & Ward, R. (2008). The permanence of family ties: Implications for youth transitioning from foster care. *American Journal of Orthopsychiatry, 78*(1), 54-62.

Collins, M. E., Spencer, R., & Ward, R. (2010). Supporting youth in the transition from foster care: Formal and informal connections. *Child Welfare, 89*(1), 125-143.

Courtney, M. E. (2009). The difficult transition to adulthood for foster youth in the US: Implications for the state as corporate parent. *Social Policy Report, 23*(1), 3-19.

Courtney, M. E., Barth, R. P., Berrick, J. D., Brooks, D., Needell, B, & Park, L. (1996). Race and child welfare services: Past research and future directions, *Child Welfare, 75*(2), 99-135.

Courtney, M.E., Dworsky, A., Ruth, G., Keller, T., Havlicek, J., & Bost, N. (2005). *Midwest evaluation of the adult functioning of former foster youth: Outcomes at age 19.* Chicago: Chapin Hall Center for Children at the University of Chicago.

Courtney, M. E. (2007). *Issue brief #115: When should the state cease parenting? Evidence from the Midwest Study.* Chicago: Chapin Hall Center for Children at the University of Chicago

Courtney, M.E., Piliavin, I., Grogan-Taylor, A., & Nesmith, A. (2001). Foster youth transitions to adulthood: A longitudinal view of youth leaving care. *Child Welfare, 80*(6), 685-717.

Daining, C., & DePanfilis, D. (2007). Resilience of youth in transition from out-of-home-care to adulthood. *Children and Youth Services Review, 29*(9), 1158-1178.

Degenne, A., & Lebeaux, M. (2005). The dynamics of personal networks at the time of entry into adult life. *Social Networks, 27*(4), 337-358.

Feld, S. L., Suitor, J. J., Hoegh, J. G. (2007). Describing changes in personal networks over time. *Field Methods, 19*(2), 281-236.

Fischer, C.S., 1982. *To Dwell Among Friends: Personal Networks in Town and City*. Chicago : University of Chicago Press.

Furman, W. & Buhrmester, D. (1991). Age and sex differences in perceptions of networks of personal relationships. *Child Development, 63*(1), 103-115.

Garland, A. F., Landsverk, J. A., & Lau, A. S. (2003). Racial/ethnic disparities in mental health service use among children in foster care. *Children and Youth Services Review, 25*(5/6), 491-507.

Goodkind, S., Schelbe, L. A., & Shook, J. J. (2011). Why youth leave care: Understandings of adulthood and transition successes and challenges among youth aging out of child welfare. *Children and Youth Services Review, 33*(6), 1039-1048.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78*(6), 1360-1380.

Haines, V. A., & Hurlbert, J. S. (1992). Network range and health. *Journal of Health and Social Behavior, 33*(3), 254-266.

Hogan, B. E., Linden, W., & Najarian, B. (2002). Social support interventions: do they work? *Clinical Psychology Review, 22*(3), 381-440.

James, S., Landsverk, J., & Slymen, D. J. (2004). Placement movement in out-of-home care: Patterns and predictors. *Children and Youth Services Review, 26*(2), 185.

Johnson, K. D., Whitbeck, L. B, & Hoyt, D. R. (2005). Predictors of social network composition among homeless and runaway adolescents. *Journal of Adolescence, 28*(2), 231-248.

Kadushin, C. (2002). The motivational foundation of social networks. *Social Networks, 24*(1), 77-91.

Kadushin, C. (2005). Who benefits from network analysis: ethics of social network research. *Social Networks, 27*(2), 139-153.

Kadushin, C. (2012). Understanding Social Networks. *New York: Oxford University Press.*

Kef, S., Hox, J. J., & Habekothe, H. T. (2000). Social networks of visually impaired and blind adolescents: Structure and effect on well-being, *Social Networks, 22*(1), 73-91.

Keller, T. E., Cusick, G., & Courtney, M. E. (2007). Approaching the transition to adulthood: Distinctive profiles of adolescents aging out of the child welfare system. *Social Service Review, 81*(3), 453-484.

Kerman, B., Barth, R. P., & Wildfire, J. (2004). Extending transitional services to former foster children. *Child Welfare, 33*(3), 239-262.

Kogovšek, T., & Ferligoj, A. (2004). The quality of measurement of personal support subnetworks. *Quality & Quantity,38*(5), 517-532.

Kogovšek, T., & Ferligoj, A. (2005). Effects on reliability and validity of ego-centered network measurements. *Social Networks, 27*(3), 205-229.

Kools, S. (1999). Self-protection in adolescents in foster care. *Journal of Child and Adolescent Psychiatric Nursing, 12*(4), 139-152.

Laser, J. A., & Leibowitz, G. S. (2009). Promoting positive outcomes for healthy youth development: Utilizing social capital theory. *Journal of Sociology and Social Welfare, 36*(1), 87-102.

Larose, S. Cyrenne, D., Garceau, O., Harvey, M., Guay, F., & Deschenes, C. (2009). Personal and social support factors involved in the decision to participate in formal academic mentoring. *Journal of Vocational Behavior, 74*(1), 108-116.

Lin, N. (1999). Building a network theory of social capital. *Connections, 22*(1), 28-51.

Louch, H. (2000). Personal network integration: Transitivity and homophily in strong-tie relations. *Social Networks, 22*(1), 45-64.

Marin, A., & Hampton, K. N. (2007). Simplifying the personal network name generator: Alternatives to traditional multiple and single name generators. *Field Methods, 19*(2), 163-193.

Marin, A., & Wellman, B. (2010). Social network analysis: An introduction. Forthcoming in P. Carrington & J. Scott (eds.), *Handbook of Social Network Analysis*. London: SAGE Publications. Retrieved from http://www.chass.toronto.edu/~wellman/publications/

Marsden, P. V. (1987). Core discussion networks of Americans. *American Sociological Review, 52*(1)*,* 122-131.

Marsden, P. V. (1990). Network data and measurement. *Annual Review of Sociology*, *16*(1), 435-463.

Marsden, P. V. (1993). The reliability of network density and composition measures. *Social Networks, 15*(4), 399-421.

Marsden, P. V. (2003). Interviewer effects in measuring network size using a single name generator. *Social Networks, 25*(1), 1-16.

Marsden, P. V. (2005). Recent developments in network measurement. In P. J. Carrington, J. Scott, & S. Wasserman (Eds.), *Models and Methods of Social Network Analysis* (pp. 8-30). Cambridge: Cambridge University Press.

Marsden, P. V., & Campbell, K. E. (1984). Measuring tie strength. *Social Forces, 63*(2), 482-501.

McCarty, C. (2000). Structure in personal networks. *Journal of Social Structure, 3*(1), retrieved from http://www.cmu.edu/joss/index.html

McCoy, H., McMillen, J., & Spitznagel, E. (2008). Older youth leaving the foster care system: Who, what, when, where, and why? *Children and Youth Services Review*, *30*(7), 735-745.

McMillen, J. & Raghavan, R. (2009). Pediatric to adult mental health service use of young people leaving the foster care system. *Journal of Adolescent Health*, *44*(1), 7-13.

McMillen, J., & Tucker, J. (1999). The status of older adolescents at exit from out-of-home care. *Child Welfare, 78*(3)*,* 339-360.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: homophily in social networks. *Annual Review of Sociology, 27*(1), 415-444.

Mendes, P., & Moslehuddin, B. (2006). From dependence to interdependence: Towards better outcomes for young people leaving state care. *Child Abuse Review, 15*(2), 110-126.

Moody, J., & White, D. R. (2003). Structural cohesion and embeddedness: A hierarchical concept of social groups. *American Sociological Review, 68*(1), 103-127.

Morgan, D. Neal, M., & Carder, P. (1996). The stability of core and peripheral networks over time. *Social Networks, 9*(1), 9-25.

Morrow, V. (1999). Conceptualizing social capital in relation to children and young people: a critical review. *The Sociological Review,47*(4), 744-765.

Munro, E. R., Stein, M., & Ward, H. (2005). Comparing how different social, political and legal frameworks support or inhibit transitions from public care in Europe, Israel, Canada and the United States. *International Journal of Child & Family Welfare, 8*(4), 191-201.

National Working Group on Foster Care and Education. (2007). Fact sheet: Educational outcomes for children and youth in foster and out-of-home care. Retrieved from http://www.nga.org/Files/pdf/0711WEBCASTFOSTERCAREFACTSHEET.PDF

Newton, R. R., Litrownik, A. J., & Landsverk, J. A. (2000). Children and youth in foster care: disentangling the relationship between problem behaviors and number of placements. *Child Abuse & Neglect, 24*(10), 1363-1374.

O'Malley, A. J., & Marsden, P. V. (2008). The analysis of social networks. *Health Services and Outcomes Research Methodology, 8*(4), 222-269.

Pecora, P. J., Kessler, R. C., O'Brien, K., White, C. R., Williams, J. Hiripi, E., English, D., White, J., & Herrick, M. A. (2006). Educational and employment outcomes of adults formerly placed in foster care: Results from the Northwest Foster Care Alumni Study. *Children and Youth Services Review, 28*(12), 1459-1481.

Perry, B. (2006). Understanding social network disruption: The case of youth in foster care. *Social Problems, 53*(3), 371-391.

Pinto, R. M. (2006). Using social network interventions to improve mentally ill clients' well-being. *Clinical Social Work Journal, 34*(1), 83-100.

Pescosolido, B. (1992). Beyond rational choice: The social dynamics of how people seek help. *American Journal of Sociology, 97*(4), 1096-1138.

Portes, A. (1998). Social capital: Its origins and applications in modern society. *Annual Review of Sociology, 24*(1), 1-24.

Pinkerton, J. (2006). Developing a global approach to the theory and practice of young people leaving state care. *Child and Family Social Work*, 11(3), 191-198.

Rice, E., Milburn, N. G., & Monro, W. (2011). Social networking technology, social network composition, and reductions in substance abuse among homeless adolescents. *Prevention Science, 12*(1), 80-88.

Robertson, J., Emerson, E., Gregory, N., Hatton, C., Kessissoglou, S., Hallam, A., & Linehan, C. (2001). Social networks of people with mental retardation in residential settings. *Mental Retardation*, *39*(3), 201-214.

Rook, K. S. (1987). Social support versus companionship. *Journal of Personality and Social Psychology, 52*(6), 1132-1147.

Samuels, G.M. (2008). A reason, a season, or a lifetime: Relational permanence among young adults with foster care backgrounds. Chicago: Chapin Hall Center for Children at the University of Chicago.

Samuels, G. M. (2009). Ambiguous loss of home: The experience of familial (im)permanence among young adults with foster care backgrounds. *Children and Youth Services Review, 31*(12), 1229-1239.

Samuels, G. M. & Pryce, J. M. (2008). "What doesn't kill you makes you stronger": Survivalist self-reliance as resilience and risk among young adults aging out of foster care. *Children and Youth Services Review (30)*10, 1198-1210.

Schofield, G., & Beek, M. (2009). Growing up in foster care: providing a secure base through adolescence. *Child and Family Social Work, 14*(3), 255-266.

Sherbourne, C. D., & Stewart, A. (1991). The MOS Social Support Survey. *Social Science and Medicine, 32*(6),705-714.

Schweizer, T., Schnegg, M., & Berzbon, S. (1998). Personal networks and social support in a multi-ethnic community of southern California. *Social Networks, 20*(1), 1-21.

Stein, M. (2006a). Research review: Young people leaving care. *Child & Family Social Work, 11*(3), 273-279.

Stein, M. (2006b). Young people aging out of care: The poverty of theory. *Children and Youth Services Review, 28*(4), 422-434.

Stein, M., & Munro, E. R. (Eds.)(2008). *Young people's transitions from care to adulthood: International research and practice.* London: Jessica Kingsley Publishers.

Strauss, A., & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory, Procedures and Techniques.* Newbury Park, CA: Sage.

Suitor, J. J., Wellman, B., & Morgan, D. L. (1997). It's about time: how, why, and when networks change. *Social Networks, 19*(1), 1-7.

Stiffman, A. R., Pescosolido, B., & Cabassa, L. J. (2004). Building a model to understand youth service access: The Gateway Provider Model'. *Mental Health Services Research, 6*(4), 189-198.

Tracy, E. M., Catalano, R. F., Whittaker, J. K., & Fine, D. (1990). Reliability of social network data. *Social Work Research & Abstracts*, *26*(2), 33-36.

Tracy, E. M., & Johnson, P. J. (2007). Personal social networks of women with co-occurring substance abuse and mental disorders. *Journal of Social Work Practice in the Addictions, 7*(1), 69-90.

Tracy, E. M., Kim, H., Brown, S., Min, M. O., Jun, M. K., & McCarty, C. (2012). Substance abuse treatment stage and personal networks of women in substance abuse treatment. *Journal of the Society for Social Work Research, 3*(2), 65-79.

Tracy, E. M., & Martin, T. C. (2007). Children's roles in the social networks of women in substance abuse treatment. *Journal of Substance Abuse Treatment, 32*(1), 81-88.

Tracy, E. M., & Whittaker, J. K. (1990). The social network map: assessing social support in clinical practice. *Families in Society: The Journal of Contemporary Human Services, 71*(8), 461-470.

Tracy, E. M., & Whittaker, J. K., Pugh, A., Kapp, S. N., & Overstreet, E. J. (1994). Support networks of primary caregivers receiving family preservation services: an exploratory study. *Families in Society, 75*(8), 481-489.

Tucker, J. S., Kennedy, D., Ryan, G., Wenzel, S. L., Golinelli, D., & Zazzali, J. (2009). Homeless women's personal networks: Implications for understanding risk behavior. *Human Organization, 68*(2), 129-140.

United States Department of Health and Human Services [USDHHS] 2009, *The AFCARS report: Preliminary FY 2008 estimates as of October 2009 (#16),* viewed 4 November 2010, <http://www.acf.hhs.gov/programs/cb/stats_research/afcars/tar/report16.htm>

Unrau, Y. A., Seita, J. R., & Putney, K. S. (2008). Former foster youth remember multiple placement moves: A journey of loss and hope. *Children and Youth Services Review, 30*(11), 1256-1266.

Walker, M., Wasserman, S., & Wellman, B. (1993). Statistical models for social support networks. *Sociological Methods & Research, 22*(1), 71.

Wasserman, S. & Faust, K. (1994). *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University Press.

Watts, D. (2004). The "New" Science of Networks. *Annual Review of Sociology, 30*(1), 243-270.

Wellman, B. (1979). The community question. *American Journal of Sociology, 84*(5), 1201-1231.

Wellman, B. (1983). Network analysis: Some basic principles. *Sociological Theory*, 1, 155-200.

Wellman, B. (1988). Structural analysis: From method and metaphor to theory and substance. In B. Wellman & S. D. Berkowitz (Eds.), *Social Structures: A Network Approach*. Cambridge: Cambridge University Press.

Wellman, B. (2007). Challenges in collecting personal network data: the nature of personal network analysis. *Field Methods, 19*(2), 111-115.

Wellman, B., & Frank, K. (2001). Network capital in a multi-level world. In N. Lin, R. S. Burt, & K. Cook (Eds.), *Social Capital* (pp. 233-273). Hawthorne, NY: Aldine de Gruyter.

Wellman, B., & Gulia, M. (1999). The network basis of social support: A network is more than the sum of its ties. In B. Wellman (Ed.), *Networks in the Global Village: Life in Contemporary Communities* (pp. 83-118). Boulder, CO: Westview Press.

Wellman, B., Wong, R, Tindall, D., & Nazer, N. (1997). A decade of network change: Turnover, persistence, and stability in personal communities. *Social Networks, 19*(1), 27-50.

Wellman, B., & Wortley, S. (1990). Different strokes from different folks: Community ties and social support. *American Journal of Sociology*, *96*(3), 558-588.

Whitbeck, L. B., & Hoyt, D. R. (1999). *Nowhere to grow: Homeless and runaway adolescents and their families.* Aldine de Gruyter; New York.

Wright, E. R. & Pescosolido, B. A. (2002). "Sorry I forgot: the role of recall error in longitudinal personal network studies", In J. A. Levy & B. A. Pescosolido (Eds.), *Advances in medical sociology: Social networks and health*, Vol. 8, pp. 113-129. Greenwich, CT: JAI Press.

Wulczyn, F., Kogan, J., & Harden, B. J. (2003). Placement stability and movement trajectories. *Social Service Review, 77*(2), 212-236.

APPENDIX A: Additional Findings

Table A.1. *Network variables by race/ethnicity*

T1 Variables	White	Black/AA	Hisp./Lat.	Mixed/Other	*p*
Network size	10.33	11.14	10.75	11.00	.971
Core network size[a]	7.06	7.14	6.00	6.00	.841
Network density[a]	.26	.23	$.51_4$	$.15_3$	**.042**
Core density[a]	$.29_3$	$.30_3$	$.67_{1,2,4}$	$.16_3$	**.019**
Transitivity[a]	$.03_3$	$.05_3$	$.20_{1,2,4}$	$.02_3$	**.030**
Network in FAMILY	3.06	2.86	3.25	2.40	.938
Network in FRIENDS	3.39	3.71	4.50	4.20	.709
Network in SCHOOL/WORK[a]	1.83	2.57	1.75	3.40	.415
Network in OTHER[a]	2.11	2.00	1.25	1.00	.368
Network diversity[a]	3.28	3.43	3.75	3.40	.687
Core in FAMILY	2.33	2.57	3.00	2.00	.881
Core in FRIENDS[b]	2.28	2.57	2.00	2.80	.865
Core in SCHOOL/WORK[a]	.94	.86	.50	.60	.957
Core in OTHER[a]	1.39	1.14	.25	.40	.110
Core in PARENT roles[a]	1.78	1.57	.75	2.00	.484
Core in SERVICE roles[a]	1.72	1.29	.25	1.00	.121
Core diversity[a]	3.00	3.00	2.75	2.20	.293
Tie frequency[a]	2.07	2.23	2.13	1.94	.498
Tie closeness[a]	2.23	2.39	2.53	2.38	.208
Tie duration	2.26	2.21	2.38	2.18	.902
Tie strength	2.17	2.27	2.33	2.19	.647
Total support[a]	44.61	47.86	40.25	47.00	.965
Total emotional support	19.44	17.29	14.00	19.00	.803
Total informational support	16.00	15.00	13.25	10.60	.695
Total concrete support[a]	10.22	15.57	13.00	9.00	.463
Support in academic domain[b]	13.22	13.43	9.25	9.40	.496
Support in career domain[a]	10.22	11.00	9.25	10.00	.992
Degree core network support	.54	.54	.60	.51	.943
Degree emotional support[a]	.64	.60	.62	.70	.806
Degree informational support	.55	.50	.57	.44	.799
Degree concrete support[a]	.37	.52	.59	.40	.133
Degree academic domain	.57	.62	.54	.53	.955
Degree career domain	.49	.49	.54	.52	.979

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD comparison.
[a]Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.
[b]Variable is normally distributed but fails Levene's test of homogeneity of variance. P-value is for the Welch statistic and the post-hoc test is Games-Howell for unequal group variance and size ($p < .05$).

Table A.2. *Network variables by T1 living situation*

T1 Variables	Foster Family	Bio Family	Alone	With Others	*p*
Network size	12.87_2	6.00_1	9.60	9.70	**.007**
Core network size[a]	8.07_2	4.00_1	6.20	6.30	**.038**
Network density[a]	.21	.41	.40	.24	.183
Core density[a]	.29	.43	.35	.30	.703
Transitivity[a]	.04	.09	.09	.03	.337
Network in FAMILY	3.93	2.50	1.80	2.20	.124
Network in FRIENDS	3.87	1.75	3.80	4.20	.188
Network in SCHOOL/WORK[a]	2.67	1.00	2.20	2.00	.380
Network in OTHER[a]	2.47	.75	1.80	1.30	.089
Network diversity[a]	3.67	3.00	3.40	3.10	.158
Core in FAMILY	3.00	2.00	1.40	2.20	.368
Core in FRIENDS	2.60	1.00	1.80	2.90	.227
Core in SCHOOL/WORK[a]	.93	1.00	1.20	.40	.464
Core in OTHER[a]	1.40	.00	1.40	.80	.071
Core in PARENT roles[a]	2.27	1.50	1.20	1.00	.122
Core in SERVICE roles[a]	1.73	.75	1.60	.90	.263
Core diversity[a]	3.20	2.25	3.00	2.50	.112
Tie frequency[a]	2.11	2.25	1.82	2.13	.114
Tie closeness[a]	2.33	2.45	2.24	2.30	.924
Tie duration[b]	2.33	2.53	2.12	2.09	.209
Tie strength	2.24	2.40	2.06	2.17	.236
Mean support per tie	6.69	7.74	6.76	6.09	.792
Total support[a]	54.60	33.50	46.20	35.00	.275
Total emotional support	23.47_3	11.25	13.00_1	16.00	**.041**
Total informational support	18.67	11.25	14.00	10.40	.116
Total concrete support[a]	13.73	11.00	10.80	8.60	.747
Support in academic domain	16.33_4	10.00	9.60	8.30_1	**.016**
Support in career domain[a]	12.87	8.50	8.60	7.80	.367
Degree core network support	.55	.58	.55	.51	.942
Degree emotional support[a]	.71	.60	.61	.56	.859
Degree informational support	.54	.58	.57	.46	.797
Degree concrete support[a]	.40	.56	.47	.39	.631
Degree academic domain	.67	.70	.43	.44	.126
Degree career domain	.51	.59	.49	.46	.854

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD comparison.
[a]Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.
[b]Variable is normally distributed but fails Levene's test of homogeneity of variance. P-value is for the Welch statistic.

Table A.3. *Network variables by T2 living situation*

T2 Variables	Foster Family	Bio Family	Alone	With Others	*p*
Network size	15.75_{2}	$9.25_{1,4}$	10.43	16.13_{2}	**.019**
Core network size[a]	$9.50_{2,3}$	5.50_{1}	5.71_{1}	8.13	**.009**
Network density[a]	.27	.25	.23	.21	.851
Core density	.37	.46	.31	.32	.689
Transitivity[a]	.03	.04	.05	.02	.150
Network in FAMILY	5.13_{3}	2.75	$2.57_{1,4}$	5.13_{3}	**.008**
Network in FRIENDS	4.63	2.75	4.14	6.00	.363
Network in SCHOOL/WORK	3.00	3.00	1.29	2.13	.338
Network in OTHER[a]	3.00	.75	2.43	2.88	.167
Network diversity[a]	3.50	3.50	3.29	3.75	.601
Core in FAMILY	$4.25_{2,3}$	2.50_{1}	1.57_{1}	3.00	**.008**
Core in FRIENDS[a]	1.88	1.25	2.29	3.63	.154
Core in SCHOOL/WORK[a]	1.88	1.50	.43	.75	.098
Core in OTHER[a]	1.50	.25	1.43	.63	.498
Core in PARENT roles[a]	2.75_{3}	1.75	$.71_{1}$	1.38	**.039**
Core in SERVICE roles[a]	2.00	.75	1.29	.50	.244
Core diversity[a]	2.88	2.75	2.43	3.13	.636
Tie frequency	2.30	2.05	2.09	2.28	.654
Tie closeness	2.48	2.64	2.32	2.49	.572
Tie duration	2.41	2.61	2.08	2.38	.167
Tie strength	2.40	2.44	2.17	2.39	.321
Mean support per tie	7.31	8.09	6.98	7.86	.224
Total support	70.50	43.25	45.57	63.11	.230
Total emotional support	30.38_{2}	14.00_{1}	18.86	26.00	**.013**
Total informational support	22.63	13.00	14.14	19.63	.310
Total concrete support	17.38	16.00	12.57	16.75	.820
Support in academic domain	18.75	10.25	11.57	14.88	.200
Support in career domain	15.88	9.25	10.71	11.63	.493
Degree core network support	.61	.67	.68	.65	.945
Degree emotional support[a]	.79	.67	.82	.82	.731
Degree informational support	.59	.59	.65	.60	.975
Degree concrete support	.45	.75	.56	.52	.459
Degree academic domain	.66	.61	.72	.62	.880
Degree career domain	.54	.58	.64	.50	.835

Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD comparison.
[a]Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.

Table A.4. *Bivariate analysis of T1 variables*

		Network correlations	Support correlations
Network structure	*Network size*	Network density (-.403*)[a] Network diversity (.442**)[a]	Total support (.528**)[a] Emotional support (.559**) Informational support (.532**) Concrete support (.390*)[a] Academic support (.393*) Career support (.517**)[a]
	Core size[a]	Core diversity (.414*)	Total support (.539**)[a] Emotional support (.637**) Informational support (.603**) Concrete support (.391*)[a] Academic support (.601*) Career support (.588**)[a]
	Core density[a]		Degree concrete support (.466**)[a]
Network composition	*Proportion of network in SWO*	Network density (-.383*)[a] Tie duration (-.508**)	
	Core members in SWO[a]	Core density (-.355*)[a] Overall tie strength (-.371*)	
	Core members in Service roles[a]	Core density (-.375*)[a] Overall tie strength (-.357*)[a]	Academic support (.474*)
	Core diversity[a]		Degree concrete support (-.343*)[a]
	Proportion of network in FAMILY	Tie duration (.644**)	
	Core members in FAMILY[a]	Tie duration (.490**)	Emotional support (.425*) Informational support (.355*)
	Core members in Parent roles[a]		Total support provided (.393*)[a] Emotional support (.377*) Informational support (.425*) Concrete support (.393*)[a] Academic support (.417*)

(Table is continued on next page)

		Network correlations	Support correlations
Relational characteristics	*Tie duration*	Network density (.427**)[a] Core density (.621**)[a] Network transitivity (.572**)[a]	
	Tie frequency[a]		Support per tie (.357*) Degree academic support (.450*)
	Tie closeness[a]	Network density (.359*)[a] Network transitivity (.361*)[a]	Degree concrete support (.393**)[a]
	Overall tie strength	Network density (.381*) Network transitivity (.472**)[a]	Support per tie (.512*) Degree emotional support (.405*)[a] Degree concrete support (.453*)[a] Degree academic support (.439*)

Note. Selection criteria for reporting correlations are statistical significance ($p < .05$) and that variables are not presumed to reflect the same network property

[a] Variable is not normally distributed. Reported coefficient is Spearman's rho.

* $p < .05$. ** $p < .01$.

Table A.5. *Network-level change variables (gain scores)*

		M	*SD*	Min.	Max.
Change in network structure	Network size	2.93	4.420	-8	12
	Ratio of T2 to T1 network size[a]	1.41	.833	.47	5.0
	Core size[a]	.78	1.908	-2	4
	Network density (0-1)	-.04	.209	-.42	.47
	Core density (0-1)	.02	.222	-.39	.58
	Transitivity (0-1)[a]	-.03	.087	-.35	.11
Change in network composition	FAMILY	1.30	1.938	-2	7
	FRIENDS	.96	2.441	-4	8
	SCHOOL/WORK	.04	2.638	-8	4
	OTHER	.59	1.927	-3	4
	Network diversity[a] (0-4)	.07	.675	-1	1
Change in core composition	FAMILY	.44	1.601	-3	4
	FRIENDS	.15	1.916	-4	4
	SCHOOL/WORK[a]	.30	1.137	-2	3
	OTHER[a]	.11	1.340	-3	3
	Core diversity[a] (0-4)	-.07	.997	-2	1
	Parent roles[a]	.04	1.055	-3	2
	Service roles[a]	-.22	1.155	-2	3
Change in relational characteristics (0-3)	Overall tie strength	.1131	.267	-.50	.67
	Frequency	.1433	.344	-.35	.71
	Closeness	.1153	.424	-1.00	.70
	Duration	.1819	.556	-1.00	1.70
Support provision	Total support (0-120)	10.89	25.122	-43	68
	Emotional support (0-40)	5.22	8.220	-10	20
	Informational support (0-40)	3.26	8.447	-17	27
	Concrete support (0-40)	3.19	8.801	-19	28
	Academic domain (0-30)	1.89	6.947	-13	16
	Career domain (0-30)	1.93	6.563	-11	17
	Degree of support from core (0-1)	.10	.240	-.33	.83
	Degree of emotional support (0-1)	.17	.229	-.15	.70
	Degree of informational support (0-1)	.09	.307	-.58	.97
	Degree of concrete support (0-1)	.09	.308	-.46	1.00
	Degree of academic support (0-1)	.09	.335	-.63	.75
	Degree of career support (0-1)	.07	.269	-.34	.83

[a]Variable is not normally distributed.

Table A.6. *Bivariate analysis of gain scores and membership stability*

		Changes in network variables	Changes in support provision
Network structure	*Network size*	Network density (-.639**) Core density (-.441*)	Emotional support (.430*) Degree informational support (-.406*)
Relational characteristics	*Tie closeness*	Network size (-.448*) Network density (.393*) Duration (.638**)	Degree overall support (.490**) Degree informational support (.458*) Degree concrete support (.548*)
	Tie duration	Network size (-.607**) Network diversity (-.446*)[a]	Degree overall support (.483*) Degree informational support (.458*) Degree concrete support (.513*)
	Tie strength	Network diversity (-.477*)[a]	
Membership stability	*Number of T1-only ties*	Core network size (-.670**)[a]	Total support (-.425*) Emotional support (-.472*) Informational support (-.382*) Concrete support (-.481*) Academic support (-.515**) Career support (-.524**)
	Number of T2-only ties	Network size (.528**) Core network size (.421**)[a] Transitivity (-.396*)[a] Tie closeness (-.422*) Tie duration (-.551**)	Degree overall support (-.574**) Degree info. support (-.645**) Degree concrete support (-.545**) Degree academic support (-.473*) Degree career support (-.454*)
	Core stability[o]	Tie closeness (.385*) Tie duration (.390*) Tie strength (.452*)	Support per tie (.556*) Informational support (.401*) Concrete support (.514**) Career support (.385**) Degree concrete support (.505**) Degree career support (.383*)

Note. Selection criteria for reporting correlations are statistical significance ($p < .05$) and that variables are not presumed to reflect the same network property

[a] Variable is not normally distributed. Reported coefficient is Spearman's rho.

* $p < .05$. ** $p < .01$.

Table A.7. *Gain scores by race/ethnicity*

	White	Black/AA	Hispanic/Latino	Mixed/Other	*p*
Network size	3.50	1.57	5.25	1.25	.491
Ratio of T2 to T1 network size	1.32	1.58	1.62	1.20	.828
Core network size[a]	.42	.43	2.00	1.25	.477
Network density	-.06	.05	-.20	.02	.267
Core density	$.01_3$	$.15_3$	$-.32_{1,2,4}$	$.18_3$	**.001**
Transitivity[a]	$.00_3$	-.03	$-.14_{1,4}$	$.02_3$	**.036**
Network in FAMILY[a]	1.00	1.86	1.75	.75	.935
Network in FRIENDS	1.67	-.57	1.25	1.25	.285
Network in SCHOOL/WORK[a]	.50	-.43	1.25	-1.75	.452
Network in OTHER	.25	.71	1.00	1.00	.873
Network diversity[a]	.17	-.29	.25	.25	.448
Core in FAMILY	.33	1.14	.50	-.50	.447
Core in FRIENDS	.50	-1.00	.50	.75	.342
Core in SCHOOL/WORK[a]	-.17	.71	.50	.75	.163
Core in OTHER[a]	-.33	-.43	.75	.25	.708
Core in PARENT roles[a]	.25	.29	.25	-1.25	.242
Core in SERVICE roles[a]	-.75	.00	.75	.00	.183
Core diversity[a]	-.17	$-.71_4$	.25	1.00_1	**.031**
Tie frequency	.11	.15	.20	.19	.960
Tie closeness	.20	.10	-.10	.11	.703
Tie duration	.18	.27	.05	.16	.944
Tie strength	.09	.24	.04	.05	.575
Mean support per tie	1.05	.58	-.81	1.87	.564
Total support	14.33	9.57	8.25	5.50	.934
Total emotional support	3.75	7.29	7.75	3.50	.734
Total informational support	4.67	2.14	-.25	4.50	.767
Total concrete support[a]	4.25	.14	.75	7.75	.380
Support in academic domain	1.67	-.43	4.50	4.00	.656
Support in career domain	2.92	.86	1.00	1.75	.920
Degree core network support	.16	.06	-.07	.19	.350
Degree emotional support	.20	.18	.08	.14	.851
Degree informational support	.19	.04	-.16	.14	.244
Degree concrete support[a]	.18	-.04	-.14	.28	**.046**
Degree academic domain	.16	-.02	.04	.12	.727
Degree career domain	.14	.00	-.08	.09	.475

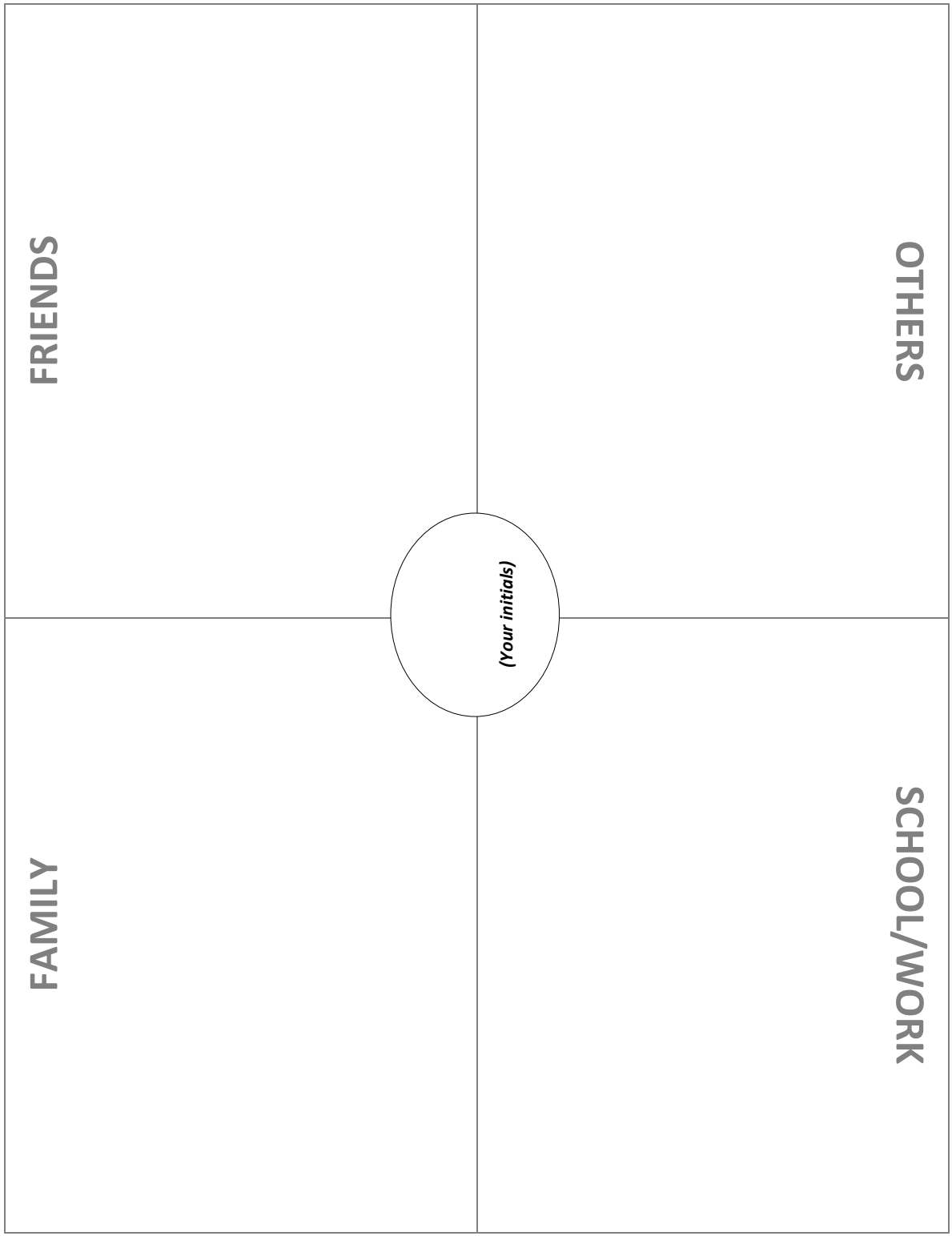
Note. Means with different subscripts in the same row differ at $p < .05$ in the Tukey HSD comparison.
[a] Variable is not normally distributed. P-value is for the non-parametric Kruskal-Wallis H test.
* $p < .05$. ** $p < .01$.

Table A.8. *Comparing enrollment by network-based support and perceived support*

T1 support variables	**Not enrolled**	**Enrolled or graduated**	***p***
Total support provided (0-120)[a]	23.33	53.38	**.031**
Emotional support provided (0-40)	9.33	21.05	**.013**
Informational support provided (0-40)[b]	6.50	17.24	**.010**
Concrete support provided (0-40)[a]	7.50	14.00	.070
Support in academic domain (0-30)[b]	5.00	14.76	**.004**
Support in career domain (0-30)[a]	5.00	11.90	**.044**
Degree of support from core (0-1.0)	.37	.59	**.020**
Degree of emotional support[a]	.28	.72	**.007**
Degree of informational support	.32	.58	**.016**
Degree of concrete support[a]	.36	.48	.336
Degree of academic support	.38	.62	.078
Degree of career support	.34	.54	.058
T2 support variables			
Total support provided (0-120)	32.83	64.67	**.010**
Emotional support provided (0-40)	14.33	26.33	**.006**
Info. support provided (0-40)	9.33	20.62	**.016**
Concrete support provided (0-40)	9.17	17.62	.067
Support in academic domain (0-30)	6.50	16.76	**.002**
Support in career domain (0-30)[a]	4.50	14.52	**.002**
Degree of support from core[b]	.47	.70	**.021**
Degree of emotional support[a]	.63	.84	**.034**
Degree of informational support	.43	.66	.050
Degree of concrete support	.37	.59	.108
Degree of academic support	.46	.71	**.027**
Degree of career support	.31	.63	**.011**
MOS support variables			
T1 emotional/informational scale (0-5)[a]	3.42	3.97	.428
T1 tangible support scale (0-5)[a]	3.88	4.04	.459
T1 positive interaction scale (0-5)[a]	3.67	4.41	.070
T1 affectionate support scale (0-5)[a]	3.83	4.35	.131
T1 sum score (0-95)[a]	69.33	78.38	.413
T2 emotional/informational scale (0-5)[a]	3.69	4.23	.317
T2 tangible support scale (0-5)[a]	3.88	4.35	.228
T2 positive interaction scale (0-5)[a]	4.22	4.62	.058
T2 affectionate support scale (0-5)[a]	4.50	4.49	.584
T2 sum score (0-95)[a]	75.83	83.00	.159

[a]Variable is not normally distributed. P-value is for the non-parametric Mann-Whitney U test.
[b]Variable fails Levene's test of homogeneity of variance. P-value is for the Welch statistic.

APPENDIX B: Support Network Map and Grid



First Name or Initials	Person's Role in Your Life	Academic Support	Career Prep	Extra-curricular	Social Support	How often?	How close?	How long?
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five
		Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Talk to them Get info/guidance Ask for favors	Daily Weekly Monthly	Not close Close Very close	Less than a year 1-5 years More than five

APPENDIX C: Other Measures

Social Support[9]

How often is each of the following kinds of support available to you if you needed it? (check one)

Type of support	**NONE of the time**	**A LITTLE of the time**	**SOME of the time**	**MOST of the time**	**ALL of the time**	***Don't know/skip***
Someone you can count on to listen to you when you need to talk						
Someone to give you information to help you understand a situation						
Someone to give you good advice about a crisis						
Someone to confide in or talk to about yourself or your problems						
Someone whose advice you really want						
Someone to share your most private worries and fears with						
Someone to turn to for suggestions about how to deal with a personal problem						
Someone who understands your problems						
Someone to help you if you were confined to bed						
Someone to take you to the doctor if you needed it						
Someone to prepare your meals if you were unable to do it yourself						
Someone to help with daily chores if you were sick						
Someone who shows you love and affection						
Someone to love and make you feel wanted						
Someone who hugs you						
Someone to have a good time with						
Someone to get together with for relaxation						
Someone to do something enjoyable with						
Someone to do things with to help you get your mind off things						

[9] Adapted from Sherbourne & Stewart (1991). Questions and response options are formatted for use here.

Student Support Network Updates[10]

T1 ties	Reason not included at T2	T2 ties	Reason added at T2

In the past 6 months, have you:

_____ moved to a new place?

_____ started working at a new place of employment?

_____ stopped working somewhere?

_____ started taking classes at a new place?

_____ stopped taking classes somewhere?

[10] This is completed by the interviewer, not the respondent.

Network Support Roles

Please check all that apply.

Supported you in the last 6 months?	Role	Supported you more than 6 months ago?
	mother (or step-mother)	
	father (or step-father)	
	siblings/cousins	
	grandparent	
	aunt/uncle/kin	
	foster parent	
	foster sibling/cousins	
	foster grandparent/aunt/uncle	
	"best" friend	
	school friend or classmate	
	other friends	
	boyfriend/girlfriend	
	roommate	
	friend from clubs/teams/church/etc.	
	teacher	
	academic adviser	
	tutor	
	job skills trainer/coordinator	
	work supervisor/manager	
	co-worker	
	DHS caseworker	
	ILP caseworker	
	other caseworker/adviser	
	lawyer or CASA	
	mental health therapist/counselor	
	assigned mentor or youth worker	