

Assessing Change in Social Support During Late Life

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The purpose of this study is to evaluate change in 14 measures of social support with data provided by a nationwide longitudinal study of older adults. The findings reveal that fairly substantial change took place during the three-year follow-up period. More important, the data indicate that change is not uniform or systematic across the entire study sample. Instead, there appears to be considerable individual-level change taking place. The implications of these findings for the development of conceptual models as well as support-based interventions are discussed.

An impressive number of studies suggest that older adults who are embedded in active social networks tend to enjoy better physical and mental health than do elderly people who do not maintain strong ties with others (Antonucci 1990). This literature is exciting because it holds out the possibility that the health of older adults can be improved by developing interventions that are designed to enhance the social support systems of at-risk elders (Gottlieb 1996). In an effort to better understand how social support systems operate in late life, researchers have conducted a number of studies to empirically evaluate change in social support over time (e.g., Feld and Minkler 1988; Kelman, Thomas, and Tanaka 1994; Matt and Dean 1993; Morgan, Neal, and Carder 1996).

Although this empirical work has made many valuable contributions to the literature, there are at least three problems with the research that has been conducted so far. First, social support is a

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complex multidimensional phenomenon that can be conceptualized and measured in a number of ways (Barrera 1986). Even so, there has been little effort to assess change in social support with a comprehensive battery of measures. Second, virtually every study focuses solely on change at the aggregate level (i.e., change across an entire study sample taken as a whole). However, as research in developmental psychology suggests, there is often substantial individual variation in change, and a more complete understanding requires that change be assessed at the individual as well as the aggregate levels (Baltes and Nesselroade 1979). Third, few studies assess change in social support with data that have been gathered from large representative samples of older adults. Clearly, findings based on nationwide surveys of elderly people are important because they enhance our ability to generalize study findings.

The purpose of this study is to address these limitations by assessing individual- and aggregate-level change in 14 social support measures with data provided by a longitudinal nationwide survey of elderly people. The discussion that follows is divided into four sections. The measurement of social support is reviewed briefly in the next section. Following this, statistical issues in the estimation of change are presented. The distinction between individual- and aggregate-level change is developed more fully in an effort to show why it is important to move beyond conventional ways of thinking about change. After this, the social support measures, study sample, and data analysis strategy are presented. Finally, the results are reviewed and discussed.

Issues in the Measurement of Social Support

To better understand change in social support during late life, it is important to carefully consider how support is measured. As the literature continues to evolve, researchers are becoming increasingly aware that social support is a complex multidimensional phenomenon and that there are a number of ways to conceptualize and measure the ties that elders maintain with others. The dimensions of support are perhaps best captured by Barrera's (1986) straightforward classification scheme. According to Barrera, there are three kinds of informal social support measures: measures of social embeddedness (e.g., the

frequency of contact with others), received support (e.g., the amount of tangible help actually provided by others), and perceived support (i.e., subjective evaluations of supportive exchanges, such as satisfaction with support).

There are two reasons why it is important for researchers to study change in social support with a comprehensive battery of measures that assess each of the major dimensions identified by Barrera (1986). First, this strategy will allow investigators to see whether all dimensions of support change over time or whether change is restricted to only certain types of social support. Second, a broad-based approach to the assessment of support is important because research indicates that some dimensions of social support are related more strongly to health and well-being (i.e., measures of perceived support) than others (i.e., measures of social embeddedness) (see Eckenrode and Wethington 1990). Describing change in these key dimensions represents an important first step toward understanding how the beneficial effects of supportive social relationships arise.

Data Analysis Issues

Having adequate social support measures is a necessary, but not sufficient, condition for studying change because researchers must use proper statistical estimation procedures as well. A simple *t*-test for differences in the means of identical measures gathered at two points in time represents one of the most straightforward ways to estimate change. In fact, the analysis of mean differences (e.g., via the analysis of variance) is frequently used to evaluate the outcome of support-based interventions (e.g., Heller et al. 1991). However, while assessing mean differences is important, it does not constitute a complete analysis of change. As Kessler and Greenberg (1981) point out, it is possible for the mean difference to be near zero even though a good deal of change has occurred at the individual level. This situation may arise, for example, because an increase in social contact by some study participants is offset by a comparable decline in social contact among other respondents. What is needed is a statistic that separates or decomposes change that affects all participants equally (i.e., aggregate change) from change that has an uneven impact in a given sample (i.e., individual change).

Recasting the analyses in terms of aggregate- and individual-level change has important implications for theory and research because change that affects all members of a sample equally may point to a very different set of causal factors than change that does not affect all elderly people in the same way. In the former case, systematic change across an entire sample indicates that the same causal processes may be at work. But in the latter situation, significant individual change would suggest that different causal processes may be operating in different subgroups of elderly people.

Method

SAMPLE

When the baseline data for this longitudinal study were gathered, the study population was defined as all household residents who were not institutionalized and who were English speaking, 65 years of age or older, and retired (i.e., not working for pay). Geographically, the study population was restricted to all eligible persons residing in the coterminous United States (i.e., people living in Alaska and Hawaii were excluded).

The sampling frame consisted of all eligible individuals contained in the Health Care Finance Administration (HCFA) Medicare Beneficiary Eligibility List. This list contains the name, address, sex, and race of virtually every older person in the United States. It should be emphasized that elderly people are included in this list even if they are not currently receiving Social Security benefits. Even so, two groups of older adults are not covered by this database: elders who do not have a Social Security number (this may be due to factors such as illegal immigration) and those who are 100 years of age or older (HCFA does not release the names of these individuals).

A three-stage process was used to draw the sample for this study. First, 5% of the names in the master file maintained by HCFA were selected with a simple random sampling procedure. Second, 110 counties across the coterminous United States were identified as primary sampling units (PSUs). These PSUs were selected with probability proportionate to the number of persons who were retired and at least 65 years of age. Following this, 10 eligible persons were selected

at random from within each PSU. Some counties (e.g., Dade County, Florida) were oversampled because they contained disproportionately large numbers of eligible older adults.

The baseline face-to-face interviews began in October 1992 and concluded in February 1993. The data collection was performed by Louis Harris and Associates. A total of 1,103 interviews were completed successfully. The response rate for the baseline interviews was 69.1%.

During October 1996 through February 1997, an effort was made to reinterview all older adults who participated in the baseline survey. The disposition of the sample at Wave 2 is as follows: Reinterviewed successfully ($n = 605$), dead ($n = 173$), moved to a nursing home ($n = 33$), refused ($n = 75$), could not be located ($n = 98$), and too ill to participate ($n = 119$). Excluding those who were either dead or residing in nursing homes, the reinterview rate was 67.5%.

After using listwise deletion of missing values to deal with item nonresponse, data were available for between 535 and 605 study participants. Preliminary analysis of the 593 respondents who provided complete data on the demographic indicators reveal that the average age at the baseline survey was 73.8 years ($SD = 6.3$ years). Approximately 38% were men. These respondents reported during the Wave 1 interviews that they had successfully completed an average of 11.1 years of schooling ($SD = 3.4$ years). Finally, approximately 50% of the people in this group were married at the time of the Wave 2 survey. These descriptive statistics, as well as the findings presented below, are based on weighted data.

MEASURES

Table 1 contains the social support measures that are evaluated in this study. In addition, the procedures used to code these indicators are provided in the notes to Table 1. It should be emphasized that the same indicators were used to measure each dimension of social support in the Wave 1 and Wave 2 surveys. These measures were selected so that they capture each of the social support dimensions identified by Barrera (1986): Social embeddedness is evaluated with measures of the frequency of contact with friends as well as family; received support is assessed with items that gauge the amount of emotional, tangible, and informational assistance actually exchanged with social network

TABLE 1
Study Measures

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1. Contact with friends^a
 - A. In the past two weeks, how often have you gone out to visit friends?
 - B. In the past two weeks, how often have you had friends visit you?
 - C. In the past two weeks, how often have you had contact by phone or letter with friends?
 2. Contact with kin^a
 - A. In the past two weeks, how often have you gone out to visit family?
 - B. In the past two weeks, how often have you had family visit you?
 - C. In the past two weeks, how often have you had contact by phone or letter with family?
 3. Emotional support received from others^b
 - A. How often has someone been right there with you (physically) in a stressful situation?
 - B. How often has someone comforted you by showing you physical affection?
 - C. How often has someone listened to you talk about your private feelings?
 - D. How often has someone expressed interest and concern in your well-being?
 4. Tangible help received from others^b
 - A. How often has someone provided you with some transportation?
 - B. How often has someone pitched in to help you do something that needed to get done, like household chores or yard work?
 - C. How often has someone helped you with shopping?
 5. Informational support received from others^b
 - A. How often has someone suggested some action that you should take in order to deal with a problem you were having?
 - B. How often has someone given you information that made a difficult situation easier to understand?
 - C. How often has someone told you what they did in a stressful situation that was similar to one you were experiencing?
 6. Emotional support provided to others^b
 - A. How often have you comforted someone by showing them physical affection?
 - B. How often have you listened to someone talk about their private feelings?
 - C. How often have you expressed interest and concern in someone's well-being?
 - D. How often have you been right there with someone (physically) who was experiencing a stressful situation?
 7. Tangible help provided to others^b
 - A. How often have you provided someone with transportation?
 - B. How often have you pitched in to help someone do something that needed to get done, like household chores or yard work?
 - C. How often have you helped someone with their shopping?
 8. Informational support provided to others^b
 - A. How often have you told someone what you did in a stressful situation that was similar to one they were experiencing?
 - B. How often have you suggested some action that someone should take in order to deal with a problem they were having?
 - C. How often have you given someone information that made a difficult situation clearer and easier to understand?
 9. Satisfaction with support received from others^c
 - A. Are you satisfied with the amount of emotional support that you have received from others, or do you wish that others had given you this kind of help more often or less often?
-

TABLE 1 Continued

-
- B. For the past few questions, we've been talking about things that people might have done for you or things they might have given to you. Thinking back over the past year, would you say you feel satisfied with this type of help, or do you wish it was given to you more often or less often?
- C. I've just asked you some questions about the amount of information people may have given you to help you deal with the problems you might have had. Thinking back over the past year, would you say you feel satisfied with this type of help, or do you wish it was given to you more often or less often?
10. Satisfaction with support provided to others^c
- A. I've just asked you about things you may or may not have done for others. Thinking back over the past year, are you satisfied with the amount of help you've given others, or do you wish you had helped others more often or less often?
11. Negative interaction^b
- A. How often have you felt that others made too many demands on you?
- B. How often have you felt that others were critical of you and things you did?
- C. How often have you felt that those around you tried to pry into your personal affairs?
- D. How often have you felt that others took advantage of you?
12. Anticipated support^d
- A. If you were sick in bed, how much could you count on the people around you to help out?
- B. If you needed to talk about your problems and private feelings, how much would the people around you be willing to listen?
- C. If you needed to know where to go to get help with a problem you were having, how much would the people around you be willing to help out?
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a. These items are scored in the following manner (coding in parentheses): not at all (1), once or twice (2), three to six times (3), more than six times (4).

b. These items are scored in the following manner: never (1), once in a while (2), fairly often (3), very often (4).

c. These items are scored in the following manner: satisfied (1), not satisfied (0).

d. These items are scored in the following manner: not at all (1), a little (2), some (3), a great deal (4).

members; and perceived support is represented by indicators of satisfaction with support, negative interaction, and anticipated support.

Social contact. As shown in Table 1, three items were used to assess how often older adults had contact with friends during the two-week period prior to the survey. Directly comparable items are used to evaluate the frequency of contact with kin. These indicators were developed by Cox and his associates (Cox, Huppert, and Whichlow 1993). A high score on these brief composite measures denotes more frequent contact with friends and family. The internal consistency reliability estimate (i.e., Cronbach's alpha) for the items assessing contact with friends was .649 at the baseline survey (T1) and .666 in the follow-up data (T2). Similarly, the reliability for the measure of

contact with kin at Wave 1 is .595, whereas the corresponding estimate based on the Wave 2 data is .612.

Support received from others. The items used to assess assistance received from others were taken from a scale used by Krause and Markides (1990) to evaluate social support in late life. Confirmatory factor analysis of these items reveals that they capture three dimensions of received support: emotional support, tangible help, and informational assistance (Krause 1995). Separate scales were developed to assess each type of received support (see Table 1). A high score on each measure indicates that elderly people received assistance from significant others more often. The internal consistency reliability estimates for each scale based on the Wave 1 and Wave 2 data are as follows: emotional support (.823 and .807, respectively) tangible help (.696 and .745), and informational assistance (.758 and .804).

Support provided to others. As shown in Table 1, support provided by older adults to others is assessed with items that are directly comparable to the measures used to gauge the amount of help they received from social network members. These indicators also come from the work of Krause and Markides (1990). Confirmatory factor analysis of these items reveals that they reflect how often older adults provide emotional support, tangible help, and informational assistance to the people they know (Krause 1995). A high score on the three composites devised to capture these dimensions denotes that an elder helped others more often. The reliability estimates for each composite based on the Wave 1 and Wave 2 data are as follows: emotional support (.833 and .850, respectively), tangible help (.634 and .697), and informational assistance (.846 and .838).

Satisfaction with support received from others. The baseline and follow-up surveys also contained items that asked respondents whether they were satisfied with the amount of help they received from their social network members. Information on these perceived support measures was obtained in the following manner: The items that assess support received from others were presented to respondents in three sections, beginning with tangible help, followed by emotional support, and then informational assistance. Each section concluded with a single item asking study participants if they were satisfied with the amount of help they received from others. This means, for example, that the section on emotional support concluded with an item that asked respondents whether they were satisfied with

the amount of emotional support they got from significant others. As shown in Table 1, separate binary measures were created from this information. A high score (i.e., a value of 1) indicates that study participants were satisfied with the help they received, while a score of 0 identifies elders who were not satisfied with the help obtained from social network members.

Satisfaction with support provided to others. Returning to Table 1, a single indicator was used to assess whether the elderly people in this study were satisfied with the amount of support they provided to their social network members. Rather than assess satisfaction with each type of social support provided (i.e., emotional, tangible, and informational), one item was used to gauge satisfaction with all types of assistance combined. Responses were coded into a binary format (1 = satisfied, 0 = not satisfied).

Negative interaction. Compelling evidence suggests that interaction with others is not always pleasant and that negative exchanges with social network members may offset (and even outweigh) the beneficial things that people do for each other (Rook 1984). To provide a more balanced view of social relations in late life, four indicators were included in the baseline and follow-up surveys to assess negative interaction. These items come from the work of Liang, Gu, and Krause (1992). As shown in Table 1, these indicators ask respondents how often others (1) make excessive demands, (2) take advantage of them, (3) are critical, and (4) pry into their personal affairs. A high score on these items identifies those study participants who encounter negative interactions more often. The internal consistency reliability estimate for this brief composite at Wave 1 is .830, while the corresponding estimate based on the Wave 2 data is .799.

Anticipated support. A small but growing number of studies indicate that one type of perceived support (anticipated support) may exert especially beneficial effects in later life (e.g., Krause 1997; Krause, Liang, and Gu 1998; Stolar, MacEntee, and Hill 1993). Anticipated support is defined as the belief that significant others are willing to provide assistance in the future should the need arise (Wethington and Kessler 1986). As shown in Table 1, anticipated support is assessed with three items that were taken from research by Liang (1990). These measures gauge whether elders feel others would be willing to provide emotional, tangible, and informational help in the future if needed. A high score on these items reflects greater anticipated support. The

internal consistency reliability estimate at Wave 1 is .819, whereas the corresponding estimate based on Wave 2 data is .868.

DATA ANALYSIS STRATEGY

Three sets of analyses are performed in this study. The first has to do with assessing short-term change in social support at the aggregate level. The second is concerned with evaluating change in supportive social ties at the individual level. Finally, since some of the baseline study participants were not interviewed at the follow-up survey, the third set of analyses is designed to provide a preliminary sense of the potential effects of sample attrition.

Assessing change at the aggregate level. The analyses provided below will begin with a conventional way of assessing change. In particular, change in each dimension of support will be evaluated by performing a simple *t*-test for the differences between the means at the Wave 1 and Wave 2 interviews. Since social support scores are provided by the same individuals at both points in time, *t*-tests will be performed using the paired-samples estimation procedure. In addition, changes in the standard deviations for each support measure will also be examined.

Assessing change at the individual level. The results provided by the aggregate statistical procedures will then be supplemented with a statistic devised by Kessler and Greenberg (1981)— Q^2 . This measure breaks down the total amount of change that has occurred in a sample into two components: uniform change that affects all participants by an equal amount (i.e., aggregate-level change) and change that is distributed unequally through a sample (i.e., individual-level change). It is important to emphasize at the outset that Kessler and Greenberg's use of the term *individual-level* differs from other uses of this term in the literature. Developmental psychologists (e.g., Baltes and Nesselroade 1979) use this term to refer to the analysis of single cases. Moreover, they have devised special estimation techniques for the analysis of changes in one participant over time (i.e., individual growth curves). However, Kessler and Greenberg (1981) use the term *individual-level* more broadly to encompass change at the single-subject level as well as change that may affect different subgroups of individuals in different ways. Since the analyses that follow are based

on Kessler and Greenberg's Q^2 statistic, their use of *individual-level change* is adopted throughout the remainder of this article.

Earlier, an effort was made to show how the distinction between aggregate- and individual-level change may be important for interpreting mean differences in social support over time. However, this distinction is also useful for interpreting results produced by other statistical procedures used in the analysis of change. This point may be illustrated by considering the case of the Pearson correlation coefficient. In effect, the correlation between identical measures at two points in time indicates the extent to which the rank ordering of study participants changes from one observation to the next. When change is primarily occurring at the aggregate level, the rank ordering of participants is preserved, and the correlation will be fairly large. In contrast, when change is taking place at the individual level, the rank ordering of participants is altered from one time point to the next, and the correlation will be relatively small.

The effect of individual-level change on means and correlation coefficients may create seemingly anomalous study findings if both statistics are computed in the same study. Assume that significant individual-level change has occurred and that decreases in support among some older adults offset or compensate increases in support among other elderly people in the same sample. Under these circumstances, the t -test for differences in support means and the correlation coefficient may present different views of what has transpired. More specifically, the t -test results would suggest that significant change has not taken place, but the correlation between the measures over time would be relatively low, indicating a fair degree of instability or change. The decomposition of change into its component parts with the Q^2 statistic would help to bring these seemingly inconsistent findings closer together.

Kessler and Greenberg (1981) begin by defining the total amount of change taking place as

$$Q^2 = \Sigma(X_{2i} - X_{1i})^2/N. \quad (1)$$

Cast within the context of the present study, X_{2i} and X_{1i} in equation (1) denote the social support score for the i th subject at Wave 2 and Wave 1, respectively, while N refers to the sample size. Since the social support values are squared, this equation produces an estimate of the sheer

magnitude of change without regard to whether scores have increased or decreased. Moreover, it is important to point out that Q^2 values are expressed in the original metric or scale of each social support measure.

Based on a series of derivations, Kessler and Greenberg (1981) reexpress the Q^2 statistic as a function of two components reflecting aggregate- and individual-level change. The revised formula is provided below.

$$Q^2 = (\bar{X}_1 - \bar{X}_2)^2 + s_1^2 + s_2^2 - 2r_{X1X2}s_1s_2. \quad (2)$$

In this equation, \bar{X}_1 and \bar{X}_2 are the mean values for a given social support measure at Wave 1 and Wave 2, respectively, s_1^2 and s_2^2 are the variance of the support scores at the baseline and follow-up interviews, r_{X1X2} is the correlation between the Time 1 and Time 2 support scores, and s_1 and s_2 are the standard deviations of the social support measures at each interview.

The first component in equation (2) (i.e., $(\bar{X}_1 - \bar{X}_2)^2$) captures change that affects all cases equally, while the remainder of the equation denotes change that has occurred at the individual level. Once equation (2) is solved, the two components are then divided by the total amount of change that has taken place (i.e., the overall Q^2 value). The resulting estimates reflect the proportion of the total change that is due to aggregate- and individual-level change, respectively.

In the analyses that follow, estimates derived with the Q^2 statistic are supplemented with simple frequency distributions showing the number of participants whose scores have decreased, remained the same, or increased over time. These additional analyses serve the following purpose: As noted above, the Q^2 analyses focus solely on the magnitude of change without regard for whether scores have increased or decreased. The supplementary frequency distributions serve the opposite purpose: Here, the goal is to depict the direction of change without regard to the magnitude.

Assessing sample attrition. When the study sample was described earlier, data were presented that reveal that some participants in the Wave 1 survey were not reinterviewed at Wave 2. The loss of study participants may bias the findings if attrition occurs nonrandomly. This is especially true when analyses focus on descriptive statistics, such as mean differences (Groves 1989). Although it is difficult to determine the extent of the problem precisely, some preliminary

insight may be obtained by evaluating whether select data gathered at the baseline survey are related significantly to participation status at Wave 2 (see Norris 1985 for a discussion of this approach). The following procedures were used to implement this strategy: First, a binary outcome measure was computed by assigning a score of 1 to all participants who were lost to follow-up and a score of 0 to those who were reinterviewed successfully at Wave 2. Then, using logistic regression, this binary outcome was regressed on the following baseline measures: age, sex, education, and all of the Wave 1 social support measures contained in Table 1. If any of these independent variables are related significantly to the binary outcome, then it would be reasonable to assume that sample attrition has occurred in a nonrandom manner.

Results

The findings from this study are presented in three sections. The potential effects of subject attrition are examined first. Following this, the results from the analysis of change at the aggregate level (i.e., the results of the *t*-tests) are presented. Finally, individual- and aggregate-level change are contrasted with data derived from estimating the Q^2 statistic.

THE EFFECTS OF SAMPLE ATTRITION

Findings from the logistic regression analyses that were designed to assess the relationship between the baseline measures and study participation status at the follow-up indicate that the loss of participants over time did not occur in a random manner. More specifically, these data (not shown here) suggest that, compared to elders who were reinterviewed successfully, older adults who did not participate in the Wave 2 survey were more likely to be older, male, and have fewer years of education. This pattern of findings is consistent with other studies of nonresponse in longitudinal surveys (Groves 1989). More important, statistically significant differences also emerged with respect to 5 of the 14 social support measures. In particular, the data indicate that, compared to elders who participated in the Wave 2 survey, older adults who were lost to follow-up had less contact with kin

at Wave 1, received more emotional support from others, gave less tangible support to their social network members, were less satisfied with tangible help received from others, and were more satisfied with the help they had given to the people they know (a table containing the results of these analyses is available from the author upon request).

Care must be taken, however, in interpreting the results of the analyses presented here. The logistic regression results assess the relationship between data gathered at the Wave 1 survey and whether a respondent participated in the Wave 2 interviews. Although this is useful information, it is possible that additional unmeasured changes took place after the Wave 1 data were gathered that further differentiate the two groups. For example, the analyses reviewed above suggest that negative interaction scores at Wave 1 did not differ significantly for those who did and those who did not participate in the survey at Wave 2. However, this does not rule out the possibility that negative interaction increased for those who were lost to follow-up after the Wave 1 data were collected, thereby further differentiating this group from the respondents who were successfully reinterviewed. This limitation, as well as the significant results discussed above, should be kept in mind as the substantive findings from the study are reviewed.

ANALYSIS OF CHANGE AT THE AGGREGATE LEVEL

The results of the analyses that were designed to assess whether significant change has taken place in the mean levels of each social support measure are presented in Table 2. In addition, this table also contains the standard deviations as well as the correlation between baseline and follow-up scores.

The results of 14 separate *t*-tests are presented in Table 2. Significant differences in the mean levels of the social support measures emerge in half of these tests. However, an examination of the data suggests that this change was not always in the same direction. More specifically, the average level of contact with friends was significantly lower at Wave 2 ($\bar{X} = 6.931$) than at Wave 1 ($\bar{X} = 7.356$). The same is also true of contact with family, although the magnitude of change in mean values does not appear to be as great (T1 $\bar{X} = 7.557$, T2 $\bar{X} = 7.355$).

Even though contact with others seems to decline over the course of the study, the data in Table 2 further reveal that elderly study

TABLE 2
Analysis of Change Using Aggregate Descriptive Statistics

<i>Dimension of Support</i>	<i>Mean</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Standard Deviation</i>	r_{X1X2}	n
	<i>Wave 1</i>	<i>Wave 2</i>	<i>Wave 1</i>	<i>Wave 2</i>		
Contact with friends	7.356	6.931***	2.304	2.281	.406+++	582
Contact with kin	7.557	7.355*	2.183	2.232	.461+++	589
Emotional received	10.409	10.825*	3.699	3.514	.281+++	593
Tangible received	5.478	5.850***	2.547	2.745	.441+++	596
Informational received	4.977	5.228*	2.105	2.262	.291+++	568
Emotional provided	10.553	10.324	3.332	3.283	.353+++	577
Tangible provided	5.928	5.195***	2.368	2.242	.489+++	602
Informational provided	5.599	5.383	2.303	2.269	.327+++	562
Satisfaction with emotional received	.890	.886	.313	.318	.147+++	605
Satisfaction with tangible received	.916	.892	.278	.310	.079	605
Satisfaction with informational received	.880	.889	.326	.315	.093+	605
Satisfaction with support provided	.674	.676	.469	.468	.254+++	605
Negative interaction	5.898	5.578	2.494	2.224	.392+++	554
Anticipated support	10.240	10.178	2.203	2.273	.382+++	535

*** $p < .001$, ** $p < .01$, * $p < .05$ for mean differences.

+++ $p < .001$, ++ $p < .01$, + $p < .05$ for correlation coefficients.

participants, nevertheless, report receiving more social support on average from their social network members. In particular, statistically significant increases are observed in the mean values of emotional support (T1 \bar{X} = 10.409, T2 \bar{X} = 10.825), tangible help (T1 \bar{X} = 5.478, T2 \bar{X} = 5.850), and informational support received from others (T1 \bar{X} = 4.977, T2 \bar{X} = 5.228). When viewed in conjunction with the data on social contact, these results suggest that elders do not experience a loss of support from their social network members even though contact with significant others declines over time.

Returning to Table 2, the data further reveal that the amount of tangible support provided by older adults to significant others appears to diminish over the course of the study (T1 \bar{X} = 5.928, T2 \bar{X} = 5.195). The only remaining difference in social support means involves negative interaction. More specifically, the data suggest that the average level of negative interaction declines significantly between the baseline and follow-up interviews (T1 \bar{X} = 5.898, T2 \bar{X} = 5.578).

An examination of the standard deviations in Table 2 provides a preliminary sense of whether the distribution of social support scores is changing over time. An increase in the size of the standard deviations would suggest that participants are becoming more dissimilar, whereas a decrease in the size of the standard deviation would point to greater homogeneity over the study period. The data provided in Table 2 indicate that both tendencies may be present and that the direction of change depends on the type of social support measure that is under consideration. In particular, eight of the Wave 2 standard deviations are smaller than their Wave 1 counterparts, while six standard deviations increase in size from the Wave 1 to Wave 2 surveys. There do not, however, appear to be any clear patterns in these findings. For example, the standard deviations of the received support measures do not decline uniformly, nor do the standard deviations associated with both social contact measures increase over time.

The analyses presented up to this point focus solely on aggregate measures of change that are presented in most studies. However, an examination of the correlation between the Wave 1 and Wave 2 support measures begins to raise doubts about the utility of relying solely on these conventional procedures. This issue is best illustrated by examining the findings involving anticipated support. According to the data presented in Table 2, the mean anticipated support value at the baseline survey (\bar{X} = 10.240) is nearly identical to mean at the

follow-up ($\bar{X} = 10.178$). Taken at face value, this would appear to indicate that little change has taken place in anticipated support. However, the correlation between the Wave 1 and Wave 2 scores is only .382. This coefficient suggests that the baseline measure of anticipated support explains only 14.6% of the variance in the follow-up measure. As noted earlier, this indicates that the rank ordering of study participants at Wave 1 is not the same at Wave 2. If this is true, then change must have taken place that is not being captured by the tests for mean differences. Similar results emerge with a number of the other dimensions of social support. In fact, in no instance does the size of the correlation between support scores over time exceed .489. This means that, at best, Wave 1 measures explain no more than one-quarter (i.e., 23.9%) of the variance in Wave 2 measures of support. Fortunately, the analyses presented in the next section help to reconcile these seemingly disparate results.¹

INDIVIDUAL- AND AGGREGATE-LEVEL CHANGE

Table 3 contains the results of the analyses that were designed to differentiate individual- from aggregate-level change. The data derived from estimating the Q^2 statistic with equation (2) are provided in the three left-hand columns. More specifically, the total change (i.e., overall Q^2 value) taking place in a given dimension of social support is presented in column 1. This coefficient is then broken down into two component parts representing uniform or aggregate-level change (column 2) and individual-level change (column 3). These results are supplemented with simple frequency distributions showing the proportion of respondents whose scores either declined (column 4), remained the same (column 5), or increased (column 6) during the course of the study.

Viewed broadly, the data in Table 3 vividly highlight the limitations of relying solely on aggregate measures of change. There are at least two ways to illustrate this point. The first has to do with reevaluating the cases in which statistically significant mean differences emerged in Table 2, while the second is concerned with correctly interpreting those instances in which statistically significant mean differences failed to emerge in the data.

Even though significant mean differences were found in some dimensions of social support, the findings provided in Table 3 reveal

TABLE 3
 Contrasting Aggregate-Level and Individual-Level Change

<i>Dimension of Support</i>	<i>Q² Results</i>					
	<i>Total Magnitude of Change</i>	<i>% Aggregate Change</i>	<i>% Individual Change</i>	<i>% Decline</i>	<i>% No Change</i>	<i>% Increase</i>
Contact with friends	6.425	2.8	97.2	48.8	37.3	13.9
Contact with kin	5.314	0.8	99.2	39.6	23.9	36.5
Emotional received	18.899	0.9	99.1	41.0	12.0	47.0
Tangible received	7.993	1.7	98.3	32.7	22.8	44.5
Informational received	6.840	0.9	99.1	33.6	27.6	38.7
Emotional provided	14.209	0.4	99.6	48.4	11.1	40.5
Tangible provided	5.979	9.0	91.0	48.3	27.1	24.6
Informational provided	7.081	0.7	99.3	41.8	23.3	34.9
Satisfaction with emotional received	.170	0.1	99.9	8.8	83.0	8.2
Satisfaction with tangible received	.160	0.4	99.6	9.2	84.0	6.8
Satisfaction with informational received	.186	0.0	100.0	8.9	81.4	9.8
Satisfaction with support provided	.327	0.0	100.0	16.2	67.3	16.5
Negative interaction	6.919	0.4	99.6	9.2	84.0	6.8
Anticipated support	6.198	0.0	100.0	16.2	67.3	16.5

that simple *t*-tests do not provide an adequate description of what has taken place. The results involving contact with kin and emotional support received from others are good examples. The data in Table 2 suggest that elders have significantly less contact with kin over time. The findings in column 4 of Table 3 show that this is true, but only for 39.6% of the respondents. In contrast, the results in column 6 further reveal that fully one-third of the respondents (36.5%) reported having more contact with kin over time. Taken together, these data suggest that the slight mean difference reported in Table 2 masks substantial change in opposite directions. These counterbalancing influences are captured succinctly by the Q^2 statistic. As the data in column 3 indicate, 99.2% of the total change taking place in contact with kin is individual-level change, not uniform change across the entire sample.

Similar findings emerge with respect to emotional support received from others. The data in Table 2 suggest that over time elderly people tend to receive more emotional support from their social network members. Although the results in column 6 of Table 3 provide some support for this view (i.e., 47% experience an increase in emotional support), the simple test for mean differences does not tell the whole story. More specifically, the results further reveal more than 4 out of 10 older adults experienced a decline in emotional support during the course of the study (41%—see column 4). Given the substantial movement in opposite directions over time, it is not surprising to find that the decomposition provided by the Q^2 statistic indicates that 99.1% of the total change in received emotional support scores may be attributed to individual-level change.

The data reviewed so far suggest that statistically significant mean differences in social support scores may not provide a complete description of change. The results provided in Table 3 further reveal that the same conclusion may be warranted when *t*-tests fail to uncover statistically significant differences in mean social support scores. This point is captured clearly in the analyses involving anticipated support. The results provided in Table 2 create the impression that little change has taken place in anticipated support. However, the findings provided in Table 3 suggest that this is not the case. Even though 16.2% of the respondents reported a decline in anticipated support over time, this trend was almost completely offset by 16.5% of the study participants who reported higher levels of anticipated support. It is for this reason that findings based on the decomposition of

change using the Q^2 statistic indicate that fully 100% of the change taking place in anticipated support scores over time is individual-level change. Stated differently, an analysis of mean differences in anticipated support creates the impression that no change has taken place even though about one-third of the sample ($16.2\% + 16.5\% = 32.7\%$) experienced change.

Simply reviewing the data provided by the Q^2 statistic (see columns 2 and 3) across all of the support measures taken together provides a useful overview of change in social support during late life. In no instance does the proportion of uniform change in any social support measure exceed even 3% of the total change that has taken place. In contrast, looking across the estimates derived for all social support measures reveals that at least 91% of the total change taking place is individual-level change that does not affect all study participants in the same way.

The data in column 5 provide yet another way to summarize the findings. These data represent the proportion of respondents with the same support score on both observations, thereby providing useful preliminary insight on whether some types of social support measures are more stable than others. Although the analysis of stability is a complex issue (see Kessler and Greenberg 1981), the findings indicate that perceived support scores are more likely to be stable over time than are measures of social contact or received support. More specifically, at least two-thirds (i.e., 67.3%) of the respondents have the same perceived support score at the baseline and follow-up interviews, whereas no more than 27.6% of the respondents have the same received support or social contact scores at Wave 1 and Wave 2.

Discussion

The findings from this study suggest that fairly substantial change has taken place in the social support systems of older adults during the relatively brief three-year course of this study. However, the data further reveal that change is not uniform or systematic. Instead, there appears to be considerable individual-level variation. In addition, the results also indicate that change is more likely to be observed with some social support measures than with others. These differential patterns of change are evident at both the individual and aggregate levels.

Three examples are briefly examined below to highlight the conceptual richness that may emerge when investigators begin to think in terms of individual- and aggregate-level change: (1) The data suggest that measures of perceived support are more stable than the other dimensions of social support; (2) at the aggregate level, elderly people tend to provide less tangible support to others over time, but the same is not true for the provision of emotional and informational support; and (3) contact with kin increases for some older adults but not for others.

At both the individual and aggregate levels, measures of perceived support appear to be more stable than measures of either social contact or received support. This finding is consistent with previous research (see Sarason, Sarason, and Pierce 1994). There is, however, little consensus about why this is so. For example, some investigators claim that greater stability in perceived support measures is due to the influence of personality factors (e.g., Sarason et al. 1994). In contrast, other researchers argue that stability in perceived support measures merely reflects the influence of ongoing mental health problems (e.g., Cramer, Hendersen, and Scott 1996). Although the resolution of this important issue is beyond the scope of this study, the factors contributing to the relatively greater stability of perceived support measures represent an important area for further research and theoretical development.

The findings reviewed earlier also reveal that at the aggregate level, elderly people tend to provide less tangible support to the members of their social networks over time, while comparable trends are less evident with respect to emotional and informational support given to others. We need to know more about why this is so. Perhaps physical illness plays a role in this respect because, unlike the other ways of helping others, providing tangible support often involves physical activity (e.g., doing yard work for a relative).

Finally, the data from this study suggest that over time some elders have greater contact with family members, while contact with kin declines for other study participants. Different causal factors may be contributing to these individual variations. For example, entry into the caregiving role may explain why greater contact with kin arises for some older adults but not for others. In contrast, the death of a sibling may shed light on why some elderly people may experience a decline in contact with kin over time.

The remainder of this section is divided into three segments. The implications of the study findings for developing and refining theories of change in social support are examined in the first section. Following this, the implications of the results for the assessment of support-based interventions are explored. Finally, the limitations in this study are discussed in detail.

IMPLICATIONS FOR THEORIES OF SOCIAL SUPPORT

The results from this study may be useful for refining theories that deal with change in social support and for resolving seemingly contradictory empirical findings in this field. Many gerontologists who focus on change in social support adopt a life-course perspective. A number of these researchers present their theories in such a way that it appears as though the general principles they contain apply to virtually every older adult. However, on closer empirical examination, it becomes evident that these theories apply to some, but not all, elderly people. Support for these general points may be found by examining two theoretical perspectives on change in social support. The first is the widely cited work of Cumming and Henry (1961) on disengagement theory, while the second involves Antonucci's (1985) notion of the support bank.

Cumming and Henry (1961) argue that as people grow older prevailing social norms encourage them to gradually withdraw from their social network members. To the extent that this is true, people should become increasingly more isolated from others as they age. However, this perspective eventually fell out of favor because a number of investigators provided data showing that older adults are not socially isolated and that their social support networks remain vibrant well into late life (e.g., Carstensen 1992). Even so, other empirical studies contradict these findings by showing that a significant proportion of elderly people do not maintain meaningful social ties with others. For example, Roberts and his colleagues report that more than 27% of the elderly people in their survey were socially isolated (Roberts et al. 1997). Viewed within the context of the present study, one might argue that both findings are correct and that these data merely show that there is significant individual variation in the way social support changes as people age. This interpretation is consistent with the broader principles in the aged heterogeneity hypothesis, which states

that differences among older adults in a number of life domains become more pronounced with advancing years (Nelson and Dannefer 1992).

Further evidence for individual change in social support may be found by focusing on Antonucci's (1985) notion of the support bank. This perspective is concerned with changes in the balance between what elders receive and what they give to others. This perspective is perhaps best described by focusing on the relationships between older adults and their offspring. Antonucci argues that early in life parents give more to their children than they receive in return. However, the exchange balance gradually changes over time and eventually becomes reversed in late life. At this point, elders give less than they get. Although a number of researchers provide data suggesting that grown offspring are a significant source of assistance for their aging parents (Silverstein, Chen, and Heller 1996), empirical work by other investigators is not consistent with the notion of the support bank. For example, research on intergenerational cash transfers suggests that at least some elders provide more to their children than they get in return. More specifically, research by Freedman and her colleagues indicates that the number of older adults who give money to their grown offspring is nearly twice as great as the number of elderly people who receive financial support from their children (Freedman et al. 1991). Although this study does not evaluate exchange balances directly, the notion that intergenerational cash transfers flow primarily from parents to children is not consistent with the basic tenets of the support-bank hypothesis.

The intent of the above discussion is not to be overly critical of the pioneering contributions that have been made to the social support literature. Instead, the purpose is to suggest that this work may be incomplete because it has not come to grips with individual-level variation in the social support process. We must be able to more clearly specify when our theories do and do not apply, and we must be able to explain why individual-level variations arise. A necessary first step in meeting this goal is to find a straightforward way of determining when this kind of theoretical elaboration is called for. A central premise of the present study is that the Q^2 statistic provides a relatively easy way of accomplishing this goal. In particular, these analyses provide an intuitively pleasing feel for the extent to which study participants fail to conform to one's theoretical specifications. If sufficient individual-level change has taken place, researchers can conduct a

series of exploratory analyses to see whether those who deviate from proposed social support processes fall into clearly identifiable subgroups. Studying the characteristics of these subgroups may, in turn, provide valuable insight into how to modify the initial theoretical perspective. This inductive approach may ultimately lead to the development of more mature theories of social support that come closer to capturing the variations and fine nuances that exist in the complex world of interpersonal ties.

IMPLICATIONS FOR SUPPORT-BASED INTERVENTIONS

The differentiation between individual- and aggregate-level change may also be of use to researchers interested in conducting support-based interventions. Most of this research relies on an experimental design whereby an experimental group participates in the intervention, while the control group does not. Measures of some mental health outcomes, such as depressive symptoms, are typically obtained before and after the intervention takes place. The effectiveness of the intervention is usually evaluated with either the analysis of variance or the analysis of covariance. If the intervention is effective, there should be a statistically significant decline in depressive symptom scores in the experimental group but not in the control group. In essence, this data-analytic strategy focuses on mean differences in depressive symptoms over time.

This mean difference is an aggregate-level statistic that captures change across the entire experimental group as a whole. Although the analysis of variance is a proper and useful technique for evaluating intervention effects, the findings from this study suggest that it may not tell the whole story. The best way to clarify this point is with an illustration. Assume that a support group has been conducted using the simple experimental procedures outlined above. Assume further that an analysis of variance reveals that a significant decline in depressive symptoms has failed to take place in the experimental group. This means that the intervention did not work for the entire experimental group as a whole. However, as the results from the present study reveal, it is possible for the mean difference to be near zero even though a good deal of change has taken place at the individual level. Stated simply, the intervention may have worked for some, but not all,

experimental participants. This is a different conclusion than one would reach by examining changes in the mean alone. The Q^2 statistic discussed in the present study provides a convenient way of quantifying this alternative interpretation. But the Q^2 analyses may be used to provide more information than this.

The assessment of individual-level change may be especially useful because it can provide valuable insight into how an intervention may be improved in the future. By looking closely at participants who did and did not improve, the investigator may get valuable clues about why the study worked in some cases but not others. This may be accomplished with a two-step, supplementary analysis strategy. First, a decomposition of change could be performed with participants in the experimental group. The goal would be to identify subgroups of study participants who experienced increases as well as decreases in depressive symptoms. The second step would involve performing some basic descriptive analyses on the members of each subgroup. So, for example, the investigator might look for differences in basic demographic data to see if the intervention was more effective with women than with men. Also, since the intervention involved social support, it is hoped that the researcher measured changes in social support during the course of the study as well. If this is the case, then subgroup differences in social support could be probed as well. The investigator might then use these supplementary analyses to look for patterns in the data that could point to ways of improving the intervention in the future. For example, research on support groups that was reviewed by Chapman and Pancoast (1985) reveals that this type of intervention is not likely to be effective for elderly single men because they do not want to depend on others. Instead, these men prefer self-reliance and the limited use of formal services such as those provided by a state agency. This kind of descriptive information is vitally important because it allows researchers to tailor specific intervention strategies to meet the needs of different subgroups of study participants. In this example, an investigator may want to include an educational module designed to help single elderly men more readily accept assistance when it is offered by others. Although identifying this subgroup of older men is useful for illustrative purposes, social support theory is not well developed, and as a result, investigators may have little a priori guidance for identifying this as well as other meaningful

subgroups in an intervention. It is precisely for this reason that the procedures discussed above may be especially useful.

STUDY LIMITATIONS

Researchers wishing to assess change in social support in late life would be well advised to pay careful attention to the limitations in this study. Four are reviewed briefly below. First, even though a large number of social support measures were assessed, this study overlooks other ways to evaluate support networks. Second, the study findings may change if a different between-round interval is used to gather the data. Third, the data were gathered at two points in time only. Finally, the estimation procedures used in this study do not take the effects of random measurement error into account.

With the exception of the social contact measures, the indicators used in this study do not take the source of social support into consideration. This means, for example, that the items assessing received emotional support focus on the assistance that has been provided by all social network members taken together. However, this global measurement strategy may mask important changes if an increase in emotional support from a spouse is offset by a decrease in emotional support from someone on the periphery of the social network (see Morgan et al. 1996). Even so, relationship-specific measures of support were not used in this study for the following reason. As noted earlier, social support is a multidimensional construct. When the questionnaire for this study was designed, a deliberate decision was made to focus on breadth at the expense of depth. This means that global measures of emotional support received and emotional support provided were used instead of devoting limited questionnaire space to a more detailed assessment of relationship-specific emotional support only. Although one strategy is not inherently better than the other, a more complete picture of the social support process requires additional work with relationship-specific measures.

The follow-up interviews in this study were conducted about three years after the baseline survey. The results are, therefore, obviously bound by this between-round interval. A more complete description of change in social support over time requires the examination of a wide range of between-round intervals, including shorter as well as longer follow-up periods.

Regression to the mean is a well-known phenomenon in the analysis of change. This means that respondents with high scores on a baseline measure tend to have lower scores at follow-up, while those with initially low scores have a tendency to move in the opposite direction. Random measurement error (discussed below) may be at least partly responsible for this problem. Having data gathered at more than two points in time helps to reduce these effects because there is some evidence that problems with regression to the mean average out over three or more data collection points (Baltes and Nesselroade 1979).

The statistical estimation procedures used in this study do not take the effects of random measurement error into account. This may create problems with estimates derived with the Q^2 procedures. As shown in equation (2), the Q^2 formula contains four components: the means, variances, standard deviations, and correlations between Time 1 and Time 2 measures. As Bollen (1989) demonstrates, random measurement error does not affect study means, but it does exert an unwanted influence on all of the remaining statistics. More specifically, he shows that random error inflates variances and standard deviations. Since these coefficients appear only in the component of Q^2 that deals with individual-level change—see equation (2)—it is possible that change operating at this level is overestimated.

Random measurement error may also influence the bivariate correlation coefficient, but the effects are complex. In particular, two problems are possible. First, the use of this coefficient rests on the assumption that both variables are measured without error. However, as the reliability estimates provided earlier reveal, this is not likely to be the case for the measures used in this study. Consequently, the bivariate correlation between identical support measures over time is likely to be attenuated (i.e., biased downward). The second problem arises when identical measures are examined at two or more points in time. If identical scales both contain measurement error, then it is likely that the error will be correlated over time (i.e., autocorrelated measurement error). The correlation between measurement errors in identical constructs is often positive (see, e.g., Krause, Liang, and Yatomi 1989). If this is true and procedures are not used to estimate correlated errors explicitly, then the correlation between identical social support measures at two points in time will be inflated. It is difficult to determine the overall effects of measurement error on the correlations because the two potential sources of bias identified here have

potentially counterbalancing effects. Nevertheless, since the correlation coefficients also appear only in the component of Q^2 that deals with individual-level change, any net effect of these difficulties will be restricted to this level of change only.² Viewed more broadly, the discussion provided here suggests that it is important to take the effects of random measurement error into account because this problem may produce biased estimates of individual-level change.

The famous German philosopher Goethe wrote that “we see only what we know.” This point captures how many social and behavioral gerontologists approach the study of change. By focusing solely on statistical procedures that assess aggregate change, investigators may be blinding themselves to subtle but important shifts taking place in their data at the individual level. Perhaps the greatest contribution of the present study arises from the fact that it calls attention to this issue, thereby expanding the scope of what researchers are capable of seeing in their data.

NOTES

1. Care should be taken in interpreting the correlation coefficients associated with the satisfaction with support measures. As the data in Table 2 reveal, these binary items are skewed. Under these circumstances, the Pearson product moment correlation coefficient may be biased. The extent of the bias may be illustrated by using tetrachoric correlations to assess the relationships among the binary satisfaction with support measures over time. The following estimates were obtained: satisfaction with emotional support received (.343), satisfaction with tangible help received (.274), satisfaction with informational support received (.235), and satisfaction with support provided to others (.424). Since the correlation coefficient appears in the formula for Q^2 —see equation (2)—the Q^2 values for the satisfaction-with-support measures may also be biased. The following strategy was used to deal with this problem: The three binary indicators were summed to create a composite denoting overall satisfaction with support received. Doing so increases the variance of the scores and reduces the amount of skewness in the data. The Q^2 analyses were then repeated with this summary score. These additional analyses (not shown here) produced results that were nearly identical to those discussed in this article (a table containing the results of these analyses is available from the author upon request).

2. An effort was made to get a preliminary sense of the extent of the bias in the correlation coefficients due to the problem of random measurement error and autocorrelated error. In particular, a latent variable model was estimated using the received emotional support measures from the Wave 1 and Wave 2 surveys. Emotional support was selected for this purpose because a number of investigators maintain that it is the most important type of received support (e.g., House and Kahn 1985). Latent variable modeling directly addresses the problems created by both sources of bias. After taking both problems into account, the correlation between the latent Time 1 emotional support and the latent Time 2 emotional support constructs was .327 ($p <$

.001). This is higher than the correlation between the observed scale scores reported in Table 2 ($r = .281, p < .001$). The Q^2 value was then reestimated for received emotional support using the correlation coefficient derived with the latent variable model. These supplementary findings reveal that 3.4% of the change in emotional support took place at the aggregate level, while 96.6% was individual-level change. This differs somewhat from the data reported in Table 3 (aggregate change = 0.9%, individual change = 99.1%). Even so, it does not alter the main conclusion: The wide majority of change taking place is individual-level change. Although this information is useful, the entire Q^2 analysis could not be repeated using latent variable modeling because it is difficult to derive means and error variances for entire scales using this technique. More specifically, Jöreskog and Sörbom (1988) provide a way to derive scale means, but they point out that it is only possible to obtain these estimates in multiple group studies and that the necessary models are not identified in single-population studies such as this one. Similarly, their latent variable modeling program (i.e., LISREL) derives estimates of measurement error variances for individual observed indicators but not for entire multiple indicator scales.

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