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Social Relations, Health Behaviors, and Health Outcomes: A Survey and Synthesis

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The primary goal of this paper is to summarise current evidence on social relations and health, specifically how social integration and social support are related to health behaviors and health outcomes, using results from published reviews. Our analysis revealed that social relations are beneficial for health behaviors such as chronic illness self-management and decreased suicidal tendency. The salutary effects of general measures of social relations (e.g. being validated, being cared for, etc.) on health behaviors (e.g. healthy diet, physical activity, smoking, alcohol abuse) are weaker, but specific measures of social relations targeting corresponding health behaviors are more predictive. There is growing evidence that social relations are predictive of mortality and cardiovascular disease, and social relations play an equally protective role against both the incidence and progression of cardiovascular disease. On the other hand, evidence was mixed for the association between social relations and cancer. We discuss these findings and potential areas for future research such as other dimensions of social relations, support–receiver interactions, and observer ratings of social relations.

Keywords: cancer, cardiovascular disease, health behaviors, mortality, social relations, social support

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INTRODUCTION

Since the seminal works by Cassel (1976) and Cobb (1976) on social relations as a generalised protective factor in health, there has been a proliferation of studies on this topic, culminating in the first meta-analyses done by Schwarzer and Leppin (1989, 1991). A keyword search of "social relations" or "social support" and "health" in PsycINFO and MEDLINE showed that before the year 2000, there were 7,757 articles on this topic, but in the past decade alone there have been 18,487 new articles. This sharp increase points to a growing interest in this topic, for example research on social isolation, loneliness, and health (Cacioppo et al., 2002; Cacioppo & Hawkley, 2003), divorce and death (Sbarra & Nietert, 2009; Sbarra, Law, & Portley, 2011) amongst many others. Thus, it is increasingly difficult to navigate this subject due to its breadth and the voluminous numbers of articles. In view of this, we seek to provide an updated overview to this topic by surveying and summarising the literature.

In our review, we use the theoretical models linking social relations and health proposed by Cohen and Wills (1985), Uchino (2006), Berkman (1995), and Antoni et al. (2006) as summarised in Figure 1. We examine how social relations are associated with different types of health behaviors (i.e.

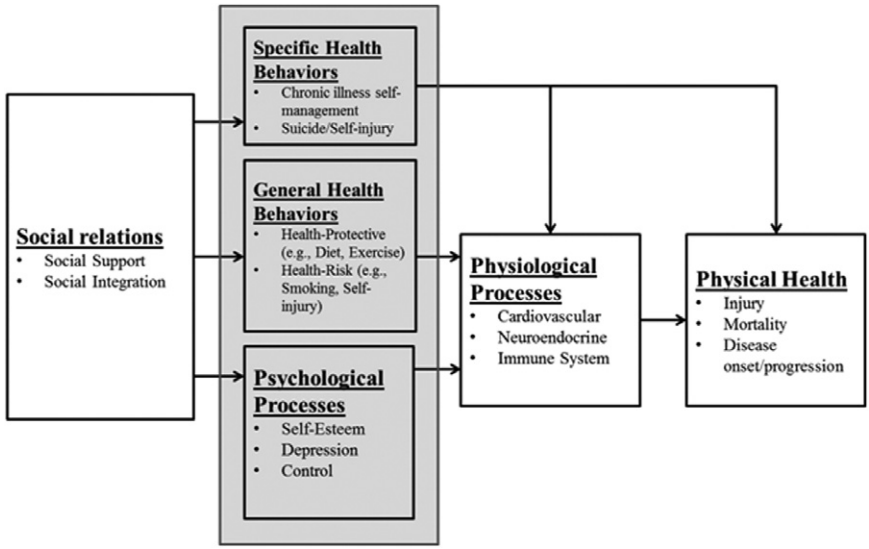

FIGURE 1. Pathways from social support to physical health.
Note: Interactions between health behaviors and psychological processes are denoted by the gray frame.

healthy diet, physical activity, smoking, alcohol abuse, chronic illness self-management, and suicide/self-injury) and the extent to which social relations affect different physical health outcomes (i.e. mortality, cardiovascular disease, and cancer). To balance breadth with depth, we focus on the use of past systematic reviews, meta-analyses, and narrative reviews on these different aspects of health. Because there are excellent reviews describing the linkages between social relations and physiological processes (e.g. Cohen, 1988; Cohen & Herbert, 1996; Cohen & Wills, 1985; Miller, Chen, & Cole, 2009; Reblin & Uchino, 2008; Uchino, 2006, 2009), we omit these from our review for space considerations. By evaluating the literature on health behaviors and health outcomes in a panoramic manner, we seek to contribute to the literature by raising new questions that arise from a broad summary of social relations and health.

The paper is structured as follows: (a) conceptual definition of social relations and the issues that could affect the association between social relations and health behaviors; (b) conceptual questions underlying social relations and health behaviors that serve to guide our current review and literature search; (c) a summary and discussion of the results for different health behaviors and outcomes.

Social Relations

Conceptual Definition. We focus on two aspects of social relations that have been identified as important predictors of health and well-being (Cohen, 2004)—social support and social integration. Social support is defined as the perception or experience that one is loved and cared for by others, esteemed and valued, and part of a social network of mutual assistance and obligations (Wills, 1991). Following this definition, social support may involve specific instances of actual support whereby one person explicitly receives benefits from another, or it may involve simply the *perception* that these benefits and resources are available should they be needed. It is often delineated in terms of three different types: instrumental, informational, and emotional. Respectively, they involve the provision of tangible and material aid; the provision of resources or strategies that may be needed to deal with a problem; and providing warmth and nurturance to a person. Furthermore, there can also be different sources of social support such as support from family, support from friends, or support from colleagues.

Social integration is defined as the participation in a broad range of social relationships (Brissette, Cohen, & Seeman, 2000). Social integration is often measured by the number of social relationships, contact frequency as well as the structure of interconnections amongst these relationships (Taylor, 2007). For example, measures of social integration primarily focus on the social networks of individuals, including their structure (e.g. size, range, density) and

characteristics of ties (e.g. frequency of contact) (Berkman, Glass, Brissette, & Seeman, 2000). Other proxies of network structure include features such as marital status, living arrangement, and the extent of organisational involvement/activity (e.g. church, group activities) (House, Landis, & Umberson, 1988). Social integration may be measured using a single index (e.g. marital status or activity engagement) or a combination of indices, which are sometimes referred to as complex measures.

Potential Moderators. One important moderator of social relations and health is social norms. Durkheim (1951) proposed that social norms function to regulate behavior, and individuals are continuously influenced by the social environment, and the behavior of others offers social proof regarding propriety (Cialdini, 1984). There have been a multitude of theories attempting to explicate social norms and their effects on behaviors (e.g. theory of reasoned action/theory of planned behavior: Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; social judgment theory: Sherif, 1936; focus theory of normative conduct: Cialdini, Reno, & Kallgren, 1990). In particular, we focus on Cialdini et al.'s focus theory of normative conduct, where they distinguished between descriptive and injunctive norms. Descriptive norms describe normality in terms of what most people do, whereas injunctive norms describe rules of moral approval or disapproval and these norms can have important consequences for physical health behavior as well as outcomes. Conforming to social norms can offer clear advantages on health as they can provide us with information to make accurate judgments, gain social approval, and increase self-esteem (Mollen, Ruiter, & Kok, 2010). However, the disadvantages of conformity may outweigh the advantages. For example, hanging out with friends who smoke will present the descriptive norm of smoking; further, these friends may encourage the individual to do the same, which generates an injunctive norm of smoking. Therefore in our view, social relations may not necessarily lead to healthy behaviors if social norms within the group dictate otherwise. In fact, when social relations are plentiful, it might be a double-edged sword, creating positive (e.g. sense of belonging) as well as negative (e.g. negative social norms) associations with health (Revenson, Schiaffino, Majerovitz, & Gibofsky, 1991).

A closely related issue is methodological; specifically, how social relations are measured in reviews and primary studies. At times, general measures of social relations that are non-specific to the health behavior of interest are used. Certain behaviors may be more susceptible to social norms because of a greater possibility of being shared with social network members (e.g. smoking) as compared to other behaviors (e.g. chronic illness management) and general measures of social relations do not capture the effects of positive or negative social norms on health behaviors. For instance with regard to smoking or alcoholism, individuals who feel that they are loved and valued

by others and experience high general social support also experience negative social norms, resulting in non-congruence between social relations and health behaviors.

At other times, measures of specific social relations focusing on support of health behaviors are used; for example, whether one receives targeted support for corresponding health behaviors such as smoking or exercise. Unlike general measures of social relations, the effect of social relations on health behaviors in this case is clearly defined. Therefore it is likely that specific measures of social relations, rather than general measures, would be more strongly related to health behaviors. On this basis, we attempt to differentiate these two aspects where possible.

Social Relations and Health: Conceptual Questions

In the following, we present some conceptual questions that guide our review. First, what is the association between social relations and different health behaviors? It has been more recently understood that not all social relations are necessarily health promoting. Burg and Seeman (1994) reviewed evidence showing that family relationships are associated with the adoption and maintenance of unhealthy behaviors including smoking, physical activity, and unhealthy dietary habits. Individuals with a family history of substance abuse or unhealthy coping behaviors may experience a sense of support when they engage in maladaptive habits (e.g. smoking) together with their family members (cf. Wills & Yaeger, 2003). On the other hand, social relations may have a more positive association with health behaviors that are less frequently shared between the focal individual and their social network such as chronic illness self-management and suicide/self-injury. In the former scenario, social relations may have a weak or even negative association with more common health behaviors such as smoking, exercise, or diet. However, social relations measured as encouragement or influence toward a target behavior may have the opposite effect.

Second, are social relations equally effective for different types of disease? One key dimension may be disease severity. It has been suggested that the effectiveness of social relations may be contingent on the severity of the disease (Cohen, 1988). The biological and behavioral mechanisms can have a greater influence on disease development in some cases than in others. For example, social relations may be more helpful for certain forms of cancer with higher survival rates. To our knowledge, this claim has yet to receive examination. Complementary evidence has shown that subjective well-being increases health and longevity but its effects on certain diseases such as cancer remain controversial (Diener & Chan, 2011). In view of this, we seek to bring evidence to bear on this issue as we summarise the evidence on different disease outcomes.

Third, how do social relations affect the life course of disease formation and progression (Cohen, 1988)? The extent to which social relations play a protective role against disease incidence versus disease progression has not been extensively reviewed. Current research will be used to examine the prediction of disease incidence versus prognosis.

With regard to the previous three conceptual questions, we examine epidemiological evidence to determine whether an association exists. Where available, we also evaluate reviews on interventions that promote social relations (e.g. social support intervention) to see if there is a causal basis for social relations on health behaviors and outcomes. This is because in most conceptual models, social relations are antecedent to health outcomes and behaviors (see Figure 1).

METHOD

A literature search was conducted using PsycINFO and MEDLINE with keywords "social support" or "social integration" or "social networks" and "review" with the keywords found in Table 1. The eligibility criterion was whether the papers were meta-analyses, systematic reviews, or narrative reviews of social relations and the specified health behaviors or outcomes. References of the reviews were examined and subsequent hand searches were conducted. We found 146 articles in total, of which 51 articles were relevant, including those from subsequent hand searches. Apart from these papers, we also included nine papers suggested by the reviewers and these are denoted by asterisks in the result tables.

Using these articles, the second and fourth authors coded for (a) the type of article (i.e. meta-analyses, systematic reviews, or narrative reviews); and (b) the measures used in the reviews. We also present a summary of the main

TABLE 1
Keyword Search for Review Articles

Key terms	*No. of articles found*	*No. of relevant articles*
Diet / Exercise / Physical activity	25	9
Substance use / Alcohol use / Smoking	26	7
Chronic illness self-management	7	7
Suicide / Self-injury	21	1
Mortality / Morbidity	35	6
Cardiovascular diseases / Coronary heart disease / Cardiovascular reactivity	23	17
Cancer progression / Cancer development / Cancer prognosis	10	9
Total	146	51

findings for each paper. Where appropriate, we include pertinent primary studies when discussing findings from the reviews.

RESULTS

Social Relations and Health Behaviors

One important mediational component between social relations and health outcomes is health behaviors as shown in Figure 1. Social relations can facilitate health behaviors (Cohen & Lemay, 2007; Uchino, 2004) because they can in part promote positive psychological states that are thought to motivate general health-protective behaviors (e.g. diet, exercise) and reduce health-risk behaviors (e.g. smoking, alcohol abuse) (see Cohen, 2004; Uchino, Uno, & Holt-Lunstad, 1999). On this basis, there would be a strong association between social relations and general health behaviors. However, social relations may encompass negative health behaviors especially when social norms for negative health behaviors are strong (Burg & Seeman, 1994). For example, smoking and drinking may be interwoven with increased social interactions (Cohen & Lemay, 2007). Therefore, when using traditional measures of social support, negative health behaviors may persist and even be reinforced by higher levels of support. Further, perceptions of social support may be a strong function of individual differences where some individuals tend to perceive higher levels of support regardless of health behaviors (Uchino, 2009). However, social support for health behaviors—such as receiving encouragement to exercise—may exhibit a stronger relationship because this directly measures whether individuals are influenced by supporters to engage in target health behaviors.

Relatedly, if health behaviors that are engaged in by the individual are relatively unique within their social circle, social relations may have a stronger association with such behaviors. This is because social relations are less likely to impose negative behavioral norms for unique behaviors; the relationship between social support and such health behaviors would be more apparent. Scenarios include supporters providing accountability and assistance for more specific medical-related health behaviors such as chronic illness self-management (e.g. medical adherence) (Gallant, 2003), or emotional help for individuals engaged in self-injurious behaviors. Also, if ratings are made about support for specific health behaviors, they may be less likely to be influenced by individual dispositions as compared to general support perceptions (cf. Shiffman, Stone, & Hufford, 2008).

Overall, the research suggests that social relations measured broadly are not predictive for health behaviors such as healthy diet, physical activity, smoking, and alcohol abuse. In studies that specifically measure *support for behaviors* or *behavioral norms*, there are stronger positive relations. Social

relations appear to be more directly related to health behaviors such as chronic illness self-management and suicide and self-injury. This may be because of the uniqueness of such behaviors that are less sensitive to behavioral norms but benefit directly from social relations. In the following, we elaborate on these findings between social relations and specific health behaviors.

Healthy Diet. By and large, the evidence suggests that the relationship between general measures of social relations and healthy diet and exercise is weak; however, specific measures exhibited a stronger relationship. Regarding healthy diet, a review of both cross-sectional and prospective studies showed that social support was related to a healthy dietary intake of fruit and vegetables for adults (Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008). Specifically four out of four prospective studies, and three out of four cross-sectional studies, showed that social support was significantly related to fruit and vegetable intake. It is important to note that social support defined in the study included support for healthy eating, such as receiving encouragement and being influenced to eat fruit and vegetables. A similar review on children and adolescents (McClain, Chappuis, Nguyen-Rodriguez, Yaroch, & Spruijt-Metz, 2009) using a general definition of social support, however, did not find consistent evidence. Table 2 presents a summary of the evidence.

Physical Activity. Few studies use general measures of social relations in association with physical activity. In two studies, measures of social isolation predicted decreased physical activity (Trost, Owen, Bauman, Sallis, & Brown, 2002). There is a proliferation of evidence for social relations specific to physical activity—in the form of social influence, active members in the family, encouragement for activity—in predicting physical activity (Frankish, Milligan, & Reid, 1998; McNeill, Kreuter, & Subramanian, 2006; Sherwood & Jeffrey, 2000; Trost et al., 2002). Of interest is that a comprehensive meta-analysis of 87 studies—both cross-sectional and longitudinal—showed that social influence was associated with exercise adherence (effect sizes: .25 to .44). Familial ties and support also showed moderate to large effects on exercise behaviors (effect size: .36 to .69) (Carron, Hausenblas, & Diane, 1996).

A systematic review on the effectiveness of interventions to increase physical activity by the Task Force on Community Preventive Services showed that receiving support from social relationships may be related to exercise (Kahn et al., 2002). In particular, interventions that evoked community-based support (i.e. "buddy system") were most helpful. Moreover, several empirical studies found that partner participation in intervention studies was most effective in increasing physical activity as opposed to being single or having non-participating partners (Gellert, Ziegelmann, Warner, &

TABLE 2
Social Support and Healthy Diet Reviews

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
McClain et al. (2009)	77	Healthy children and adults	Familial social support Friend social support	Meta-analytic systematic review	Social support was not a consistent predictor of dietary behaviors in children and adolescents. Only 1 out of 7 articles reported positive association between social support and fruit, fruit juice, and/or vegetable consumption; 1 out of 4 articles reported the same for fat intake; mixed result was found for energy intake; no association was found between social support and sugar snacking/sweetened beverage consumption; all 3 articles reported positive relationship between familial and friend social support and fiber intake; 5 out of 8 articles found the same for healthy dietary consumption; and mixed result was found for less healthy dietary consumption.
Shaikh et al. (2008)	35	Healthy adults	Social support	Narrative systematic review	Social support was a significant mediator (reported β: 0.15–0.18) and predictor (reported β: 0.14–0.17) of changes in fruit and vegetable intake.

N = number of studies reviewed.

Schwarzer, 2011; Hong et al., 2005; Wing & Jeffery, 1999). There was less consistent evidence for informational support. Therefore, there is reasonable evidence that some social relations supportive of exercise are related to physical activity. Table 3 summarises the reviews regarding this topic.

Smoking and Alcohol Abuse. General measures of social relations showed both positive and negative associations with the initiation of substance use, including smoking and alcohol abuse, based on a review of both cross-sectional and prospective studies (Galea, Nandi, & Vlahov, 2004). However, it was found that support for smoking or alcohol use (i.e. social norms) within networks was more important for influencing health-risk behaviors (Galea et al., 2004). This was consistent with what we found in the other health behaviors, showing that general measures of social support were less predictive compared to specific measures of social support.

Regarding social support interventions, there has been limited evidence that social support interventions are effective for smoking abstinence (Jepson, Harris, Platt, & Tannahill, 2010). A review of randomised controlled trials showed little evidence that enhancing partner support improved abstinence although it may be moderated by living arrangements; specifically, interventions may be more effective with live-in couples (E.-W. Park, Tudiver, Schultz, & Campbell, 2004). Also, unlike exercise, the use of a "buddy system" intervention was not found to be effective in general (May & West, 2000). Although the "buddy system" appeared to be effective in the context of a smoking clinic (May & West, 2000), it was not supported in a follow-up study (May, West, Hajek, McEwen, & Hayden, 2006). A quantitative review examining smoking relapse interventions showed that social support was ineffective too (Lancaster, Hajek, Stead, West, & Jarvis, 2006). In sum, social relations may be protective against smoking but interventions that enhance social relations may be insufficient for individuals to quit smoking.

For alcohol abuse, an empirical study found that for patients enrolled in a group intervention program for alcoholism having spouses who participated more frequently in the program resulted in greater family involvement, better family relations, and more positive feelings of self. These in turn were strongly associated with abstinence (McNabb, Der-Karabetian, & Rhoads, 1989). Furthermore, a meta-analysis and review of alcohol treatment programs found that the effects of social relations—both social integration and social support—were positive, but inconsistent and weak (Beattie, 2001). Some positive evidence for the effectiveness of social relations can be found in a literature review of social network variables in Alcoholics Anonymous (AA) studies (Groh, Jason, & Keys, 2008). It was found that both social integration and social support were important. Moreover, the authors found that social relations variables consistently mediated AA's impact on

TABLE 3
Social Support and Physical Activity

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Ayotte et al. (2010) *	–	Long-term married couples between 50–75	Positive Social Influence Scale	Empirical study	224 couples took part in a longitudinal study. Social support was directly positively related to self-efficacy (b = .40) and self-regulatory behavior (b = .17) with regards to engaging in physical activity. Social support was indirectly positively related to engaging in physical activity (b = .34). The relationship between social support and physical activity was through self-efficacy and self-regulatory behavior. Other covariates included chronic health conditions, outcome expectancies and perceived barriers of physical activity.
Carron et al. (1996)	87	Healthy adults	Family social support Friend social support Task-cohesion groups	Meta-analysis	Social influence positively affected exercise behaviors (both compliance and adherence), intentions and efficacy for exercise, and attitudes associated with exercise experience. Task-cohesion groups (ES = .62) and support from significant others (ES = .44) were important factors affecting exercise adherence. Family support influenced affect associated with exercise involvement (ES = .59). Family support was twice as important for individuals' compliance to exercise prescriptions from health professionals (ES = .69 for compliance; ES = .36 for adherence). Though support from family members has a greater impact on individuals' intentions to exercise, support from significant others remained a more significant influence on individuals' attitudes about exercise.
Frankish et al. (1998)	–	Healthy adults	Social integration Social influence Family members Co-exercisers	Narrative review	Social support was found to be an important factor for the development and maintenance of active living. Membership in health clubs and the presence of active members in family and social network encouraged more vigorous physical activity. Individuals with active spouses were 20 per cent more likely to be exercise regularly, while individuals with active friends were 41 per cent more likely to be also active themselves.
Gellert et al. (2011) *	–	Healthy adults over 60	Partner status Friends and Family Support for Exercise Habits Scale	Empirical study	302 individuals participated in an intervention study and were divided into 3 groups (Group 1—without partner; Group 2—with participating partner; Group 3—with non-participating partner). Individuals whose partners participated in the exercise intervention increased their levels of physical activity as compared to those whose partners did not participate or who were single. Social support was positively related to physical activity when couples participated together in the intervention. However, it was negatively related in the other two groups, suggesting mismatched support and pressure from the social network.

Hong et al. (2005) *	–	Patients with heart disease and their partners	Exercise support provided and received Exercise similarity	Empirical study	109 couples participated in a study to examine the moderating effect of partners' similarity in exercise behavior on social support provision and receipt. Individuals whose partners were similar in exercise behavior reported significant positive influences of dyadic receipt and provision of exercise support in their relationship. Individuals whose partners were not similar in exercise behavior reported no significant influence of receipt and provision of exercise support in their relationship. Effective dyadic exchanges of provision and receipt of exercise support only existed when partners were similar in exercise behavior.
Kahn et al. (2002)	11	Healthy adults	Family social support Social support groups	Narrative systematic review	Some studies reported increase in energy expenditure and aerobic capacity while some reported the reverse. Interventions targeting family social support implemented as school-based programs were slightly more effective than those implemented in the community as independent studies. 9 studies investigated the effectiveness of social support interventions in community settings. Interventions involved setting up "buddy system," making physical activity contracts, and setting up other support groups. A median net increase of 44.2 per cent for time spent in physical activity was found, as well as a median net increase of 19.6 per cent for frequency of exercise. Some studies found a median net increase in aerobic capacity of 4.7 per cent.
McNeill et al. (2006)	–	Healthy adults	Social support Social integration	Narrative review	Presence of spouse and/or supportive family or friends, and social support interventions, including "buddy systems," exercise contract, and walking groups, were found effective in increasing physical activity. Postulated mechanisms that explained relationship between social support and physical activity included establishment of social norms for physical activity, observational learning on techniques and benefits of exercise, and provision of resources that supported in physical activity participation.

TABLE 3
Continued

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Sherwood & Jeffery (2000)	9	Healthy adults	Family social support Friend social support	Narrative review	Review of research findings on the determinants of exercise behavior. 9 studies examined social support for exercise and found it to be a correlate of physical activity. Presence of social support was correlated with higher adherence of fitness program, regular participation in physical activity, and more positive attitudes toward exercise. Social support had greater influence in the motivation of exercise adoption in women than in men.
Trost et al. (2002)	38	Healthy adults	Family social support Friend social support	Narrative systematic review	9 studies examined social support for exercise (e.g. companionship during exercise, encouragements to be healthy) as a correlate of physical activity and all consistently revealed significant positive associations.
Uchino (2004)	–	Healthy adults	Informational social support Emotional social support	Narrative review	Studies found that when examining the effects of social support on mortality, when health behavior risk factors were controlled during analysis, the effect of social support on mortality was reduced. One study found statistical adjustments for risk factors including physical activity to be 16 per cent, demonstrating at least a partial mediation. Informational support from a health care provider and emotional support facilitated positive behavioral changes. The association between structural support and all-cause mortality was weaker when health behaviors were considered.
Wing & Jeffery (1999) *	–	Healthy adults	Social integration Intragroup activities Intergroup competition	Empirical study	166 participants were recruited either alone or with a friend to participate in a weight-loss program. 95 per cent of participants who were recruited with a team of 3 friends and treated with the social support intervention completed the 10 month study and 66 per cent maintained their weight loss in full. Participants recruited with friends had a 33 per cent greater weight loss at Month 10 as compared to those recruited alone. Recruitment strategy had greater influence on weight loss than social support (intragroup activities and intergroup competition). Other covariates included were initial weight, marital status and participation in prior weight loss programs.

N = number of studies reviewed.

abstinence. Importantly, the authors found that individuals with initial negative social networks supportive of drinking benefited most from AA involvement because individuals replaced substance-using friends with individuals who abstain. Therefore, this suggests that measures of social support that take into account influences on target health behaviors are more directly related than general measures of social support. Table 4 summarises the reviews on this topic.

Chronic Illness Self-Management. For the aforementioned health behaviors, general measures of social relations are less likely to be directly associated because they do not account for health behavior norms—which negatively influence health behaviors with increasing levels of social relations. By contrast, we propose that chronic illness self-management behaviors are those that are pertinent only for sufferers of chronic illnesses such as coronary heart disease and cancer. These behaviors include medical adherence and diet management. Under these conditions, the surrounding behavioral norms may have less of an impact on individuals because they are less relevant to health behaviors specific to chronic illness self-management. Therefore, general social support may have a stronger positive relationship with chronic illness self-management.

From our review, we found that social relations in general were related to behavioral changes in chronic illness self-management, but this effect appears to be moderated by the type of illness. In a review of 30 studies, several psychosocial factors were examined in relation to adaptive health behaviors in the context of cancer diagnosis and treatment (Park & Gaffey, 2007). The authors found that social support was related to health-protective behavioral change in both the general population and cancer patients but the types of behaviors were mixed. Social support was related to increased exercise in breast cancer survivors and abstinence from smoking in head and neck cancer survivors who smoked. A review of 29 studies, primarily cross-sectional, found that both general and specific measures of social support were moderately associated with self-care behaviors for diabetes (Gallant, 2003). Together, this suggests that social support may be more helpful for health behavior change in the context of certain types of illness such as diabetes, in which disease progression may be more easily modifiable, or perceived as modifiable, by specific self-management behaviors (see also Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992). For example, social support is more related to diabetes as compared to cardiovascular disease (Gallant, 2003). After surviving head or neck cancer, social support was effective for quitting smoking (Park & Gaffey, 2007). Also, family-oriented interventions as compared to patient-only interventions had small effects on chronic pain, psychological distress, and blood-pressure control, but this effect was reversed for rheumatoid arthritis (Martire & Schulz, 2007).

TABLE 4
Social Support and Smoking and Alcohol Abuse

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Beattie (2001)	297	Healthy adults	Functional support Marital status	Meta-analysis	High level of functional support predicted more positive drinking outcomes (weighted mean $r = 0.220$), and the relationship was accentuated with the involvement of significant others in treatments ($r = 0.416$). However, structural support (i.e. marital status) was weakly associated with positive drinking outcomes ($r = 0.110$). The correlation dropped to 0.064 when female populations were involved in studies reviewed.
Cohen & Lemay (2007)	–	Healthy adults	Social Network Index	Daily diary study	193 adults participated in a survey and were then interviewed for 14 consecutive days. Between-subjects analysis showed that, in general, individuals with higher level of social integration had lesser smoking (b = –.50, ES = .15) and drinking behaviors (b = –.09, ES = .16). However, within-subjects analysis showed that the drinking and smoking behaviors of individuals with low level of social integration increased with the number of interactions they had in that particular day (drinking: b = .21, ES = .27; smoking: b = .20, ES = .25), while the effect was not seen in individuals with high level of social integration. These results controlled for communal orientation, Big Five Personality, perceived social support, negative affect, stress, mastery and purpose in life.
Galea et al. (2004)	108	Healthy adults	Social integration Social norms	Narrative systematic review	Limited evidence was found to substantiate the effect of social support on smoking, alcohol use, and drug use behaviors. Having members in one's family and social network who smoked, consumed alcohol and used drugs predicted a greater likelihood of initiation of cigarette use, alcohol and drug consumption, and alcohol dependence or abuse. Social norms within network were reported to have a stronger influence on initiation, continued use or misuse, and cessation of the aforesaid behaviors than family characteristics.

Groh et al. (2008)	24	Alcoholic adults	Social integration Instrumental social support	Narrative systematic review	AA membership and participation, through which participants gained and strengthened friendship networks, improved friendship quality and friend resources, and improved partner relationship quality, positively impacted abstinence and recovery from alcohol abuse, especially for individuals with harmful social networks supportive of drinking. One study found that the odds of abstinence were 1.6 times higher for those receiving support from others in AA. However, its influence on expanding and improving networks consisting of family members or others was less.
Jepson et al. (2010)	103	Healthy adolescents and adults	Family social support Friend social support Social integration	Narrative systematic review	Limited evidence substantiated that social support interventions (i.e. buddy system, friends or family support) and interventions aimed at improving social competence were effective in aiding smoking cessation, preventing relapse, or preventing initiation of tobacco use. However, interventions such as group counseling and pharmacological treatment to overcome nicotine addiction implemented in community or workplace settings were found to be effective. School-based interventions with involvement of the family or community were associated with increased physical activity in adolescents. Similar results were found with interventions involving continued guidance, advice, and support from professionals for adults.
Lancaster et al. (2006)	42	Smokers	Social support	Meta-analytic systematic review	Interventions designed to prevent relapse in recent smoking quitters, including skills training, pharmacotherapy and extended treatment contact, were ineffective in helping recent smoking quitters to avoid relapse (OR .86–1.30). In one study on military personnel, less than 3 per cent of the participants used the telephone support offered in one trial.

TABLE 4
Continued

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
May & West (2000)	10	Smokers	Friend social support Group treatments	Narrative systematic review	Two types of "buddy" support intervention aiming at smoking cessation were identified: one sought to improve the quality of existing support and another to initiate new ties. Out of 10 studies that examined the effectiveness of "buddy" support intervention on smoking cessation reviewed, only 2 showed that such intervention was effective and significant in increasing the smoking abstinence rate.
May et al. (2006)	–	Smokers	Group treatment	Empirical study	563 smokers participated in a group treatment program for smoking cessation and were randomised into two groups (237 into groups with buddy system and 326 into groups without buddy system). Buddy system, which allowed provision of mutual support between paired smokers, did not predict greater improvement in smoking abstinence rates than in groups without buddy system at 1, 4 and 26 weeks period.
McNabb et al. (1989) *	–	Alcoholic adults	Family involvement	Empirical study	80 patients suffering from alcoholism participated in a group treatment program (Group 1—spouses attended 3 or fewer sessions; Group 2—spouses attended 4 or more sessions; Group 3—spouses treated as inpatients). Results suggested that greater family involvement, better family relations, and positive self-feelings were strongly associated with abstinence.
Park et al. (2004)	9	Smokers	Partner social support	Meta-analysis	The effects of partner support intervention on smoking cessation were not substantiated, but suggested that smoking cessation intervention with live-in couples might be more effective than other partner forms. At 6–9 months of the intervention, the reported abstinence was 0 per cent to 64.7 per cent for intervention groups and 0 per cent to 88.2 per cent for control groups; at more than 12 months, the reported abstinence rate was 12.4 per cent to 58.8 per cent for intervention groups and 15.2 per cent to 64.7 per cent for the control groups.

N = number of studies reviewed.

Among chronic illness self-management behaviors, medical adherence is particularly important. It has been estimated that non-adherence rates are very high and a recent meta-analysis of 569 studies across 50 years suggests non-adherence rates of about 25 per cent (DiMatteo, 2004b). Overall, social relations are associated with medical adherence and interventions that boost social relations were found to be effective half the time.

A comprehensive meta-analysis of 122 studies of the association between social relations and medical adherence showed a significant effect (DiMatteo, 2004a). The results suggest that social integration (family cohesiveness, marital status, living arrangement) and social (practical, emotional, global) support were related to medical treatment adherence. Among social support types, practical support was most related to medical adherence; patients with low support were 1.9 times more likely not to adhere to treatments. Overall, social support was more related to medical adherence than social integration. This was consistent with findings from Sherbourne et al. (1992) who found that social support was a better predictor of medical adherence than social integration.

Meta-analysis of intervention studies using randomised controlled trials found limited evidence for the effectiveness of interventions of social relations combined with informational, behavioral interventions: Eight out of 15 interventions had moderate to large effect sizes on adherence (Kripalani, Yao, & Haynes, 2007); 18 out of 32 studies found that couple interventions had more positive impact on psychological functioning compared to usual care or patient-only care whereas the remaning studies showed mixed or null results (Martire, Schulz, Helgeson, Small, & Saghafi, 2010). Therefore, medical adherence and social relations are associated, and social support interventions were found to be effective half the time. Table 5 presents a summary of these studies.

Suicide and Self-Injury. There are non-trivial percentages in both the general population of adults (4%) and clinical samples (19%–25%) who engage in self-injury (Nock, 2010). Suicide is an extreme example of self-injurious behaviors. Classic work on suicide has shown that it is negatively correlated with social relations (Durkheim, 1951/1897). Paralleling chronic illness self-management, social relations in general has been found to be associated with lowered incidence of suicide and self-injury.

Because we did not find a review on social relations and suicide, we describe large-scale empirical studies that have examined this topic. In a nationally representative sample of Canada, being separated or divorced led to the likelihood of suicidal acts escalating 37 and 7 times, respectively (Blackmore et al., 2008). Moreover, even after controlling for gender, education, income, marital status, employment, religiosity, and illness, tangible social support was negatively related to suicidal acts. A national sample of

TABLE 5
Social Support and Chronic Illness Self-Management

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of Review*	*Findings*
DiMatteo (2004a)	122	Chronically ill adults	Practical support Emotional support Social support Social integration	Meta-analysis	The risk of nonadherence to medical regimen in individuals who did not receive practical support (ES .31), emotional support (ES .00–.37), and social support (ES .20 and .21) in general were 3.6 times, 1.35 times, and 1.53 times higher than individuals who did, respectively. Both low levels of family cohesiveness and high levels of family conflict contributed to 1.74 and 1.53 times higher risk of nonadherence. Unmarried individuals were 1.13 times more likely to not adhere to medical regimen, and increased the risk of nonadherence in children by 1.35 times. Adults who lived with others were 1.38 times more likely to adhere to medical regimen, more so for behavioral regimens than for medical regimens. The relationship between adherence and functional social support (practical, emotional, and family cohesiveness) was significantly stronger than that of structural social support (marital status and living arrangement).
DiMatteo (2004b)	569	Chronically ill adults	Social integration	Meta-analysis	A meta-analysis of 569 articles on patient adherence showed an average nonadherence of 24.8 per cent. The level of adherence was higher when patients had greater access to resources such as education and income and were prescribed to more circumscribed regimens (medication as opposed to pervasive health behaviors). The highest adherence rates were observed in patients with HIV, arthritis gastrointestinal diseases, and cancer; the lowest were observed in patients with pulmonary disease, diabetes, and sleep problems.
Gallant (2003)	29	Chronically ill adults	General social support Illness-specific support Regimen-specific support Social integration	Meta-analytic systematic review	Of 13 methodologically sound studies, 6 reported a significant positive relationship between social support and self-management behaviors, especially for diabetes, another 6 reported partial relationship, while the remaining 1 reported no relationship. Regimen-specific support was better than general support in promoting adherence of different self-care behaviors for diabetes, heart disease, epilepsy, and kidney disease. Receipt of diabetic-specific support was more effective than perception of support in improving self-care behaviors; however the effect was seen only in men but not in women.

Kripalani et al. (2007)	37	Chronically ill adults	Social support	Meta-analytic systematic review	6 out of 12 studies on informational interventions reported a significant increase of at least one measure of adherence, but the effect size for most studies remained moderate. 8 out of the same 12 studies showed that informational interventions did not improve clinical outcomes. Behavioral interventions, most commonly dosage simplification, improved adherence (effect size 0.89–1.20), though its impacts on clinical outcomes were mixed. Other behavioral interventions that involved assessment, feedback, reinforcement, or rewards also bolstered adherence (effect size 0.27–0.81). Implementation of combined interventions was found effective in improving adherence, as reported in 13 out of 15 combined intervention studies.
Martire and Schulz (2007) *	–	Chronically ill adults	Family social support	Narrative review	Studies have found that family-oriented interventions generally have small effects even though prior research has established that interactions with close family members are important for the well-being of chronically ill patients. Family interventions have been found to have small positive effects on reducing depression, anxiety and risk for mortality as opposed to usual medical care. Family interventions have also been found to have significant improvements in chronic pain, psychological distress and blood-pressure control compared to patient-only interventions but this result was reversed for rheumatoid arthritis.

TABLE 5
Continued

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of Review*	*Findings*
Martire et al. (2010) *	33	Chronically ill adults	Group social support Partner social support	Meta-analytic review	18 out of 32 studies found that couple intervention had more impact on psychological functioning as opposed to usual care or patient psychosocial intervention. 7 studies found no differences whereas the rest of the studies showed mixed effects. Couple interventions had significant effects on depressive symptoms ($d = .18$), marital functioning ($d = .17$) and pain ($d = .19$). Effects though significant were small in magnitude, and findings suggest that couple interventions should be targeted at couples with high illness-related conflict, low partner support or low marital quality.
Park & Gaffey (2007)	30	Cancer patients	Perceived social support Marital status	Narrative systematic review	Breast cancer patients who had greater social support (i.e. presence of confidante and being married) were engaged in more vigorous and increased frequency of exercise. A positive relationship between perceived social support level and smoking abstinence was found in head and neck cancer survivors. However, social support was unrelated to healthful dietary changes in breast and colon cancer survivors. Similar effects were seen in other social support measures, such as social constraints and social control.
Sherbourne et al. (1992)	–	Diabetic patients	Emotional support Social integration	Longitudinal study	In a sample of 348 diabetic patients, social support predicted better adherence to medical regimen. Functional social support (i.e. reassurance and emotional support provided in close interpersonal relationships) was a better predictor of medical regimen adherence than structural social support (i.e. the quantity of friends and relatives). Other covariates included in the study were health perceptions, coping strategies, health knowledge and practitioner–patient relationship.

N = number of studies reviewed.

USA adolescents also showed a strong inverse association between social support and suicidal acts, controlling for self-reported misconduct and history of suicide ideation and attempts (Winfree & Jiang, 2010). In this case parental expressive social support was more inversely related to suicide than tangible support. Data from the Center for Disease and Control and Prevention (CDC) in 2005 show that social integration—specifically participation in group sport activities—was associated with lower suicide risk, including suicidal thoughts and attempts (Taliaferro et al., 2008). A fine-grained analysis indicated that interpersonal conflict and belongingness were significant predictors of a history of suicidal ideation, and that belongingness, perceived social support, and living alone were significant predictors of suicide attempts, controlling for depression as well as substance use (You, Van Orden, & Conner, 2011). This suggests that both social integration and social support play a role in reducing suicide.

There is also a bidirectional relation between social relations and self-injury. For example, a review of self-injury strongly suggests that such behaviors are used to elicit social support (Nock, 2010). This implies that a lack of social relations may be the key issue underlying self-destructive behaviors. More evidence for the causal nature of social support on suicide comes from a 4-year prospective study among 1,253 college students demonstrating that low perceived social support consistently predicted suicidal ideation, controlling for depression, domestic violence, substance abuse, and affective dysregulation (Wilcox et al., 2010). Stronger evidence comes from one of the first randomised control trials demonstrating that social network intervention for suicide was effective for girls in reducing suicidal ideation, but not for boys (King et al., 2009). Overall, this demonstrates that the lack of social relations is predictive and possibly causal in relation to suicidal ideation and suicide. These results are summarised in Table 6.

Social Relations and Health Outcomes

We evaluated how social relations are associated with various health outcomes including mortality and disease outcomes. Because social relations help to buffer stress and promote positive states (see Cohen, 2004), social relations have been historically proposed as a generalised protective factor, and in particular is protective against mortality (Cassel, 1976; Cobb, 1976). Aside from mortality, social relations are thought to be protective against disease outcomes (Cohen, 1988). According to the CDC (2011), cardiovascular disease and cancer are the leading causes of death in America. Therefore, social relations were examined in relation to these specific diseases (cf. Uchino, Cacioppo, & Kiecolt-Glaser, 1996); disease outcomes evaluated included incidence, progression, and morbidity.

TABLE 6
Social Support and Suicide / Self-Injury

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Blackmore et al. (2008)	–	Healthy adults	Social integration Instrumental social support Informational social support	Empirical study	A large Canadian national epidemiological survey of 36,984 respondents reported that being separated or divorced and social isolation were strong correlated with suicidal acts and attempts. Frequent and regular religious participation posited increased instrumental support and broader social network were protections against suicidal acts or attempts. Other covariates included socioeconomic status, psychiatric diagnoses, health status and religiosity.
King et al. (2009)	–	Suicidal adolescents	Social integration Social support	Empirical study	448 suicidal adolescents (319 girls and 129 boys) recruited in the National Institute of Mental Health were randomised into two intervention groups: one with only treatment-as-usual (TAU) and another with both TAU and Youth Nominated Support Team-Version 2 (YST-II), an intervention that involved youth-nominated adults as behavior models and to provide social support. YST-II moderately reduced adaptive impairment in adolescents without history of multiple suicide attempts, and reduced suicidal thoughts in adolescents with multiple suicide attempts, though the effect for the latter was limited to a 6-week follow-up period.
Nock (2010)	–	Adolescents and adults	Social support	Narrative review	Self-injury behaviors served interpersonal function of increasing social support and attention. Community-based self-report studies observed that family relationships of adolescents improved following their self-injury episode.
Taliaferro et al. (2008)	–	9th–12th grade students	Social support Social integration	Empirical study	Data from 2005 Youth Risk Behaviors Survey (YRBS) were analyzed. Analysis showed that frequent physical activity and high sports participation was associated with reduced odds of hopelessness and suicidality among adolescents. The result alluded to higher social support level and social integration as potential underlying protective mechanisms against suicidality.

Wilcox et al. (2010)	–	College students	Social support appraisal scale	Longitudinal study	A 4-year study in one large mid-Atlantic university conducted from 2004 to 2008 with 1,253 first-year college students revealed that low perceived social support posited relative risk ratio of 3.7 for one-time suicide ideators (95% CI (2.0–6.6) and relative risk ratio of 5.1 for persistent suicide ideators (95% CI (2.0–13.1). Other covariates in this study were own depression, family history of depression, victimisation and exposure to domestic violence, substance abuse and affective dysregulation.
Winfree & Jiang (2010)	–	Adolescents	Parental social support School social support	Empirical study	Parental support (parental expressive support and parental behavioral support) and school support were correlated with suicidal ideations and attempts in a sample of 4,318 respondents aged 11–18. A 6 per cent decrease in suicidal ideations and 8 per cent decrease in suicide attempts were seen with every unit increase in parental expressive support. No significant findings were found for parental behavioral support. Other covariates such as self-reported misconduct and history of suicide ideation and attempts were controlled for.
You et al. (2011)	–	Individuals with Substance Use Disorders	Interpersonal Needs Questionnaire Kessler Perceived Social Support Scale	Empirical study	Decrease in perceived social support (OR .98), decrease in belongingness (OR .96), presence of interpersonal conflict, and living alone predicted higher probability of suicide attempts and ideation, with the exception of social support which was only associated with attempt and not ideation. A 2 per cent increase in suicidal ideation and attempt was seen with every one point decrease in perceived social support. Other covariates such as substance use as well as depression were controlled for.

N = number of studies reviewed.

Overall, there is clear evidence demonstrating that a lack of social relations is predictive of overall mortality, as well as incidence of cardiovascular disease and its progression. The effects of social relations on cancer outcomes are mixed as it may be modulated by the severity of disease. The presence of social relations was more effective for breast cancer outcomes compared to other types of cancer (e.g. lung cancer) or mixed cancers, but was less effective for individuals with severe CVD (e.g. heart failure). Although both social integration and social support were associated with mortality, complex measures of social integration (e.g. marital status + network size + network participation) were more predictive. Similarly, there is more evidence that low social integration was associated with cancer outcomes. On the other hand, social support was more associated with CHD incidence and prognosis. These findings on social relations and specific health outcomes are elaborated further.

Mortality. There is strong evidence that the lack of social relations is associated with a higher risk of mortality. Historically, based on Cassel's and Cobb's seminal ideas that social relationships moderate or buffer potentially problematic health effects of stress or other hazards, House et al. (1988) used five prospective studies that controlled for initial health status and other factors to show that low social relations—in terms of quality and quantity—was linked to mortality with relative risks ranging from (1.08 to 4.00). Additional analyses with other prospective studies showed that social relations had an aetiological fraction (AF) of 30 per cent, which represents the proportion of mortality that would not have occurred if the social relations risk factor not been present in the population (Olsen, 1993). This was comparable to AFs of smoking and mortality, which ranged from 25 per cent to 39 per cent, as estimated in two primary studies. Also, Cohen's (2004) narrative review presented that healthy adults who were more socially integrated (i.e. were married, had close family and friends, etc.) were more likely to still be living than more isolated counterparts. Furthermore, a recent comprehensive meta-analysis of 148 prospective studies showed that social relations were an important predictor of all-cause mortality (Holt-Lunstad, Smith, & Layton, 2010). Overall, the effect size odds ratio was 1.50, showing that there is a 50 per cent greater likelihood of survival for those with strong relationships. The magnitude of effect was also quite comparable to smoking on mortality.

Holt-Lunstad et al. (2010) also analyzed the extent to which various types of social relations were related to mortality. They found that both social integration and social support were important. The odds ratio for the various supports suggests that a complex measure of social integration (e.g. marital status + network size + network participation, OR = 1.91) was more important for mortality prediction than perceived social support (OR = 1.35), which in turn was more important than received social support (OR = 1.22, *ns*). Indeed, a 5-year longitudinal study showed that providing social support to

others (i.e. instrumental support to friends and emotional support to spouse) rather than receiving social support was related to decreased mortality even after controlling for various demographic, personality, health, and mental health status (Brown, Nesse, Vinokur, & Smith, 2003). Furthermore, a meta-analysis carried out by Pinquart and Duberstein (2010b) found that higher levels of perceived social support, larger social network, and being married were associated with a decrease in relative risk for mortality for cancer patients.

These data strongly suggest that social relations are associated with mortality. But does having fewer social relations cause mortality? Experimental data from animal models strongly demonstrate that social isolation is related to increased risk for morbidity and mortality (House et al., 1988). However, social relations interventions on mortality have been less clear. One of the primary issues is that social relations interventions occur in the context of chronic illnesses to buffer disease-specific mortality rather than all-cause mortality. A review of social relations intervention studies with various health outcomes did not show consistent effects of social support on mortality (Hogan, Linden, & Bahman, 2002). However, the authors suggested that this was because the intervention types differed greatly, along with the subpopulations, and a range of health outcomes were examined. Another meta-analytic review of 70 randomised studies comparing family member interventions with usual medical care on a range of health outcomes found that there were positive effects on mortality when mixed family members (i.e. support from different family members including spouses) were engaged (Martire, Lustig, Schulz, Miller, & Helgeson, 2004). This is consistent with past research showing the importance of family support over other forms of support in relation to physiological functioning (Uchino et al., 1996). These findings are summarised in Table 7.

Cardiovascular Disease: Prediction and Prognosis. The association between social relations and cardiovascular disease has been extensively studied and there is strong evidence suggesting that a lack of social relations is a risk factor for developing cardiovascular disease and poorer prognosis as well. Several review papers on longitudinal studies have examined the role of social support in predicting incidence of coronary heart disease (CHD). In one of the early reviews of this issue, Greenwood, Muir, Packham, and Madeley (1996) found that social relations were related to initial incidence of clinical disease. Another review showed that in five out of eight longitudinal studies of healthy populations, lack of social relations was predictive of events such as fatal CHD and myocardial infarction (MI), even when many of the studies controlled for traditional risk factors (e.g. age, blood pressure, and family history) (Hemingway & Marmot, 1999). Based on a systematic review, a strong or moderate association between social support and CHD

TABLE 7
Social Support and Mortality

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Brown et al. (2003)	–	Older married adults	Giving and receiving instrumental support Giving and receiving emotional support	Empirical study	The Changing Lives of Older Couples (CLOC) study revealed that provision of support to others (instrumental support to neighbors, friends and relatives; emotional support to spouse) greatly reduced the risk for mortality after controlling for demographic, personality, health, and marital-relationship variables. The results for receipt of support were mixed: receipt of emotional support was associated with reduced risk of mortality, while receipt of instrumental support predicted higher risk of mortality. Other covariates such as social contact, spousal dependence, equity of the relationship and marital satisfaction were controlled for.
Cohen (2004) *	–	Healthy adults	Social integration	Narrative review	Healthy adults who were more socially integrated (were married, had close family and friends, belonged to social and religious groups) were more likely to still be living than their more isolated counterparts.
Hogan et al. (2002)	100	Healthy adults	Social integration Family social support Friend social support	Narrative systematic review	In general, social support interventions had positive effects on health despite some mixed results. Group interventions that provided support through family, friends, and peers were all found to improve well-being and symptomatology. Similarly, support groups and social support skills training showed health benefits. Some studies reported reductions in mortality following individual interventions through the use of professionals, but the majority did not find effects from interventions that provide professional support. Some studies on effects of professional supportive interventions on myocardial infarction patients reported significantly reduction in mortality rates, while some failed to replicate the results.

Holt-Lunstad et al. (2010)	148	Healthy adults	Social integration Social support	Meta-analysis	Social relationships were effective in reducing mortality. A 50 per cent increase in survival was seen in participants with stronger social relationships (OR 1.50; 95% CI 1.42–1.59). This overall effect size includes significant findings for structural measures of social support (OR 1.57), functional aspects of social relationships (OR 1.46), and combined assessments of social relationships (OR 1.44). The effect was consistent across age, sex, initial health status, cause of death, and follow-up period. Complex measures of social integration (i.e. a single measure that assessed multiple components of social integration such as marital status, network size and network participation) was the strongest predictor of survival rate increment (OR 1.91; 95% CI 1.63–2.23); while the binary indicators of residential status (i.e. living alone vs. with others) was the weakest predictor (OR 1.16; 95% CI 0.99–1.44).
House et al. (1988)	–	Healthy adults	Social integration	Narrative review	A negative relationship between social integration and mortality rates after controlling for age was observed; the relationship was stronger in males (Relative Risk Ratio RR 1.08–4.00) but weaker in females (RR 1.07–2.81). Experimental studies showed the presence of familiar others reduced cardiovascular activity and physiological arousal of human subjects in stressful laboratory situations; similar findings were reported in the animal literature.
Martire et al. (2004)	77	Chronically ill adults	Social integration Instrumental social support	Meta-analysis	Family interventions had significant effects on preventing patient mortality (effect size $d = .08$, $p = .06$, $k = 0$). Family interventions enhanced patient survival in general, except dementia patients. Involving mixed groups of family members and not focusing on relationship issues reliably reduced mortality rates, with an effect size of .14 and .13, respectively. However, family interventions that involved only spouses and discussion on relationship issues did not reliably decrease mortality.
Pinquart & Duberstein (2010a) *	87	Cancer patients	Social integration Perceived social support	Meta-analysis	Higher levels of perceived social support, larger social network and being married were associated with decrease in relative risk for mortality of 25 per cent, 20 per cent and 12 per cent, respectively. Never married patients were found to have higher mortality rates than widowed/divorced/separated patients.

N = number of studies reviewed.

was found in six out of nine studies (Kuper, Marmot, & Hemingway, 2002). One of the strengths of these types of studies is that because social support is assessed before clinical signs of the disease are present we can be more certain about the directionality of influence from low social support to CHD rather than the converse (Orth-Gomer, 1994).

If a lack of social relations potentially leads to incidence of CHD, what is the effect size? In the review by Hemingway and Marmot (1999), the relative risks, where calculated in studies, ranged from 1.14 to 2.13 in the eight studies examined. Similarly, a more recent review showed that fewer social relations conferred a relative risk of 1.5 to 2.0 in healthy populations for CHD incidence and deaths (Lett et al., 2005). A recent systematic review further examined the impact of social integration and social support (Barth, Schneider, & Kanel, 2010). Three studies assessed social support and myocardial infarction (MI). The hazard ratios—an estimate of relative risk—ranged from 1.00 to 4.25. One study found a significant effect whereas another found a significant effect only for men. Also, one study reported an effect size of 0.20 from a time-dependent Cox regression analysis that was not significant. On the other hand, social integration and prevalence of MI were examined in two studies but were not significantly related to CHD. Overall, this shows that having fewer social relations—particularly social support—confers a substantial risk to CHD incidence.

Longitudinal studies show that having fewer social relations is also related to poorer CHD prognosis. Prognostic cohort studies showed that social support was related to the prognosis of patients in that it was related to mortality in nine out of ten studies (Hemingway & Marmot, 1999). Another systematic review found that 14 out of 21 prognostic studies showed substantial linkages (Kuper et al., 2002). Further, a systematic review found that 18 out of 19 prognostic studies had at least one measure of social relations—both social support and social integration—that was predictive of CHD outcomes such as cardiac mortality and mortality in CHD patients (Lett et al., 2005).

The effect size between social relations and CHD prognosis appears to be similar or larger than CHD incidence. Based on a review of several large primary studies, it was suggested that having fewer social relations has an even greater association with CHD prognosis than incidence (Greenwood et al., 1996). Although Lett et al. (2005) showed that low social relations predicted CHD events (e.g. mortality or cardiac mortality) with a relative risk of around 1.5 to 2.0—similar to that of CHD incidence—Hemingway and Marmot (1999) found that across the 10 studies, the relative risk calculations ranged from 1.46 to 5.60.

There were differential predictions between social integration and social support on CHD prognosis, with social support being more important. One systematic review consistently showed that low social support was negatively

linked to cardiac and all-cause mortality (pooled relative risk [1.59–1.71]), but low social integration did not increase mortality in patients with CHD (Barth et al., 2010). A literature review of prospective studies investigating the empirical evidence between social ties, social support, and social conflict on health outcomes (e.g. MI, CVD mortality, or carotid atherosclerosis) found similar trends. Low social support—specifically emotional social support—was related to about a three-fold risk of MI and CHD mortality, and fatal and non-fatal CVD. On the other hand, low social integration was found to produce about twice the risk of fatal CHD and CVD mortality (Everson-Rose & Lewis, 2005).

Disease severity appears to be an important moderator of the relationship between social relations and CHD prognosis. Social relations were less effective for patient samples that had more severe CVD. One review showed that for patients who experienced heart failure (HF), the relationship between social relations and prognostic measures was mixed (Luttik, Jaarsma, Moser, Sanderman, & van Veldhuisen, 2005). Out of 17 studies, only four found a relationship between social relations and rehospitalisations and mortality. In another review, examining studies that focused on patients with congestive heart failure (MacMahon & Lip, 2002), there was mixed evidence for social support. Importantly, the authors ensured that major surgery was not confounded with social support.

Cardiovascular Disease: Interventions. Although there is consistent evidence showing that social relations are related to CHD, there is mixed evidence on the effectiveness of intervention studies in reducing clinical CVD outcomes. In part, it is difficult to ascertain which aspect of social relations is being targeted in these broad-based intervention studies. It is also difficult to determine the effects of the interventions because there appear to be a number of moderating effects found in previous studies. These include (1) evaluation of treatment effectiveness, (2) gender, (3) timing of treatment, and (4) the type of social relation. In the following, we discuss some reviews of psychosocial interventions that may not directly examine social relations, but highlight some of these aforementioned points.

First, a meta-analysis of 37 psychosocial intervention studies showed that there was a 34 per cent reduction in cardiac mortality and a 29 per cent reduction in MI (Dusseldorp, van Elderen, Maes, Meulman, & Kraaij, 1999). Interventions that were successful on proximal physiological/behavioral/psychological outcomes (systolic blood pressure, smoking behavior, physical exercise, emotional distress) were more effective on health outcomes (cardiac mortality and MI recurrences) than interventions without success on proximal outcomes.

Second, a meta-analysis of 23 randomised trials showed that psychosocial interventions reduced all-cause mortality at follow-up of 2 years or less

compared to usual care (Linden, Phillips, & Leclerc, 2007). This effect was found for men (odds ratio = 0.73) but not women. Third, interventions that started at least 2 months after a cardiac event were more protective against mortality (odds ratio = 0.28) compared to treatments that started immediately after the event (odds ratio = 0.87). It was speculated that early recruitment targets patients with much better psychosocial resources, and they often recover with or without interventions regardless whether they were in the treatment or in the control group.

Finally, a meta-analysis by Uchino et al. (1996) found that family ties and social support were more important to cardiovascular functioning than other types of social relations. This trend is borne out in intervention studies as well. A meta-analysis of 70 randomised controlled studies focusing on the effects of psychosocial interventions when a family was included compared to usual patient care showed that spousal engagement lowered depressive symptomology ($d = .33$), and mixed family member engagement (e.g. spouses and adult children) reduced the risk of mortality ($d = .14$), specifically in cardiac patients (Martire et al., 2004). On the other hand, systematic review of peer-support interventions for heart disease patients based on six randomised controlled trial studies found more limited support (Parry & Watt-Watson, 2010). There were, however, some positive effects on self-efficacy, activity levels, reduced pain, and fewer emergency room visits. In another review of 38 articles, no positive health benefits were found for online peer-to-peer interventions (Eysenbach, Powell, Englesakis, Rizo, & Stern, 2004). There was mixed evidence from a review of 55 articles using randomised controlled trials of nursing interventions in patients with coronary artery disease or heart failure (Allen & Dennison, 2010). Therefore, this suggests that family-based interventions may be more useful compared to interventions using other sources.

In sum, many factors need to be considered when evaluating the effectiveness of social relations interventions on CVD. Currently, it appears that family-based interventions are more useful compared to usual patient care. Although psychosocial interventions are useful in addressing causality, animal studies can directly address this issue because of direct assignment to support or non-supportive conditions. In a review of psychological factors linked to CVD, it was shown that a lack of social relations (i.e. social isolation) in swine and monkeys leads to atherosclerosis (Rozanski, Blumenthal, & Kaplan, 1999). A summary of these studies linking social relations and cardiovascular outcomes can be found in Table 8.

Cancer. There are clear pathways by which social relations and stress are related to cancer (Uchino et al., 1996). Specifically, stressors release stress hormones which then modulate the tumor microenvironment; stress hormones can also activate oncogenic viruses and lower immune functioning

TABLE 8
Social Support and Cardiovascular Disease

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Allen & Dennison (2010)	55	Patients with heart disease	Informational social support Emotional social support Instrumental social support	Meta-analytic systematic review	Nursing interventions incorporating education plus behavioral counseling and support were the most commonly employed interventions in patients with coronary artery diseases (CAD) or heart failure (HF), in addition to educational and informational interventions. 57 per cent of these interventions showed significant positive outcomes in at least one of the following domains of CAD or HF patients: blood pressure, lipids, dietary intake, cigarette smoking, weight loss, healthcare utilisation, mortality, quality of life, and psychosocial outcomes.
Barth et al. (2010)	6	Healthy adults Patients with heart disease	Social integration Social support	Meta-analytic systematic review	Low functional social support was found to contribute to the prevalence of CHD in healthy population (RR range, 1.00–2.23), but such effect was not seen in structural social support. A similar trend was found in 26 prognostic studies: lack of functional social support significantly predicted cardiac mortality (pooled RR range, 1.59–1.71), while the effects of lack of structural support in cardiac mortality remained unclear.
Dusseldorp et al. (1999)	37	Patients with heart disease	Emotional social support Informational social support	Meta-analysis	A meta analysis of 37 randomised or quasi-experiments examined the effect of health education (activities and instruction between health professionals and CHD patients) and stress management (supportive interventions such as the opportunity to express emotions with others) interventions on CHD patients. Population effect size estimates were calculated and found significant odds of survival 1.52 times higher for treatment then control groups, which was equivalent to a 34 per cent reduction in cardiac mortality. There was also a significant 29 per cent reduction in recurrence of MI.
Everson-Rose & Lewis (2005)	–	Patients with heart disease	Emotional social support	Narrative review	The literature review suggested that the absence of structural social support was related to 1.78 to 2.61-fold increased risk in cardiovascular disease (CVD) mortality both in initially healthy populations and coronary patients over a 5 year period. Low functional social support, especially in the form of emotional support, was also associated with an increase of 2.9 to 3.1 risk of MI and CHD incidence in originally healthy samples and of mortality in coronary heart disease patients.
Eysenbach et al. (2004)	38	Healthy adults	Social support Social integration	Narrative systematic review	A review of 38 articles on online peer-to-peer interventions and complex interventions, which combined educational or cognitive behavioral therapy with peer-to-peer interventions, did not find such interventions effective in inducing positive health outcomes including reducing depression, weight loss, or smoking cessation.

TABLE 8
Continued

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Greenwood et al. (1996)	4	Healthy adults Patients with heart disease	Social integration Emotional social support	Narrative systematic review	Social support was a stronger predictor for new incidence of coronary heart disease (CHD) than stress. Family problems, signifying damage to perceived familial support, predicted higher risk of angina pectoris in Israeli men. Associations were found between social resources and severity of CHD. Low emotional support and poor social integration also predicted higher incidence of major coronary events. Quality of social support, especially emotional support, had a greater influence on CHD mortality than initial incidence of CHD. A 4-fold increase in CHD mortality was observed in patients with low social support.
Hemingway & Marmot (1999)	21	Healthy adults Patients with heart disease	Social integration Emotional social support	Narrative systematic review	5 out of 8 studies using a healthy population revealed a positive relationship between social support and etiology of coronary heart disease (CHD). Similar patterns were found for the role of social support on the prognosis of CHD in 9 out of 10 studies done on coronary heart disease (CHD) patients, with 3 studies reporting relative risks exceeding three. Differences between functional and structural social support on etiology and prognosis of CHD were not addressed.
Kuper et al. (2002)	30	Healthy adults Patients with heart disease	Social support	Narrative systematic review	6 out of 9 etiologic studies and 14 out of 21 prognostic studies showed a link between social support and coronary heart disease (CHD). Authors suggested that patients with high levels of social support may be better taken care of or are more likely to seek medical help, explaining the stronger effect of social support seen in CHD prognosis than in CHD etiology.
Lett et al. (2005)	27	Healthy adults Patients with heart disease	Social integration Perceived social support	Narrative systematic review	Both low structural and emotional support were associated with increased coronary heart disease (CHD) incidence and a 2- to 4-fold increase in mortality and cardiac morbidity rate in CHD patients. However, some evidence showed that perceived functional support better predicted CHD progression than structural support. Postulated mechanisms that underlay the effects of social support and CHD included better adherence to medical recommendations and other health-promoting behaviors due to high social support level, and autonomic dysregulation in low social support conditions.

Lett et al. (2007)	–	Patients with heart disease	Perceived social support Social integration	Empirical study	Increased perceived social support predicted improved health outcomes, measured in terms of all-cause mortality and nonfatal reinfarction rates, for AMI patients without elevated depression, but not for patients with severe depression. Perceived tangible support and network support showed no association with improved clinical outcomes of AMI patients.
Linden et al. (1996)	23	Patients with heart disease	Social integration Social support	Meta-analysis	Psychosocial treatments were correlated with reductions in psychological distress, heart rates, cholesterol levels, and systolic blood pressure in patients with coronary artery disease (CAD). Patients who were treated psychosocially showed a 46 per cent reduction in recurrence of CAD for two years or less, and a 39 per cent reduction for longer follow-ups. Patients who did not receive this treatment had higher mortality rates during the first two years of follow-up (OR 1.70; 95% CI 1.09–2.64). However, the effects of psychosocial treatments were weakened when follow-up was extended.
Linden et al. (2007)	23	Patients with heart disease	Social integration Social support	Meta-analysis	Psychosocial treatments reduced short-term mortality rates by 27 per cent (OR 0.72; 95% CI 0.56–0.94) and longer-term recurrence of cardiac events by 43 per cent in cardiac patients (OR 0.57; 95% CI 0.37–0.86). The beneficial effects of psychosocial treatments on mortality were found only for men but not for women in both short-term and long-term follow-ups (OR 1.01 and OR 1.30, respectively). Mortality reductions were strong for studies that initiated the treatment at least 2 months after the cardiac event, a 72 per cent reduction in short-term mortality (95% CI 0.12–0.70); such effects were not found for studies that initiated the treatment right after the cardiac event.
Luttik et al. (2005)	7	Patients with heart disease	Social integration Emotional social support Informational social support Instrumental social support	Narrative systematic review	6 out of 7 studies reviewed showed a relationship between presence of social support and lower hospital readmission rates due to heart failure (HF). Single marital status, poor marital quality, absence of emotional support, and social isolation were all associated with a significantly higher risk of HF mortality especially for women. Social support also predicted the quality of life of HF patients in general, though some studies did not find the same.

TABLE 8
Continued

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
MacMahon & Lip (2002)	4	Patients with heart disease	Emotional social support	Narrative systematic review	Social support was found to have mixed effects on patients with congestive heart failure (CHF). Lack of emotional social support predicted high risk of fatal or nonfatal cardiovascular events in 292 patients in a one-year longitudinal study, with emotional support only important for women but not for men. In another sample of 62 CHF patients, no association was found between social support and hospital re-admittance with these findings possibly skewed by the fact that 73 per cent of participants were married and reported having support all the time.
Martire et al. (2004)	77	Chronically ill adults	Social integration Instrumental social support	Meta-analysis	(repeated in mortality summary)
Orth-Gomer et al. (1993)	–	Men with heart disease	Social integration Attachment	Empirical study	CHD patients had lower attachment and social integration level (p = 0.07 and 0.04, respectively. Low social support level was also associated with cardiovascular risk factors, such as unhealthy lifestyle. Subjects with low social integration had higher plasma fibrinogen ($p < .001$), lack of leisure activity ($p < .001$), higher smoking rate ($p = .04$), lower S-cholesterol level ($p = .06$) and lower BMI ($p = .07$); subjects with low attachment had higher systolic blood pressure ($p = .03$), higher S-cholesterol level ($p < .001$), and lack of leisure activity ($p = .03$).
Parry & Watt-Watson (2010)	6	Patients with heart disease	Family social support Peer social support Professional social support	Narrative systematic review	Participation of heart failure patients in peer intervention was related to improved health status, health behaviors and self-efficacy, and fewer emergency room visits, decreased pain or physical discomfort, increased physical activity, higher self-care management. However, some studies showed that intervention groups had no effect on patients' physical and emotional well-being, and had higher hospital readmission rate than control group.

Rozanski et al. (1999)	15	Healthy adults Patients with heart disease	Social isolation Social support Social integration	Narrative systematic review	Social isolation or low social support predicted 2- to 3-fold increase in CAD incidence in an initially healthy population, and an approximate 2-fold increase in subsequent cardiac events in patients with existing CAD. Higher acculturation levels (viewed as social disruption) in Japanese-Americans and Italian-Americans was associated with higher incidence of CAD. Animal studies confirmed that social disruption and isolation promoted the development of atherogenesis. Pathophysiological mechanisms explaining such relationship included elevated resting heart rates and urinary epinephrine level.
Uchino et al. (1996)	81	Healthy normotensive adults	Social integration Family social support	Narrative systematic review	Social support had positive effects on the cardiovascular, endocrine and immune systems. Higher social support correlated with better cardiovascular regulation. Of 28 correlational studies, a majority of 24 studies reported a positive relationship between social support and cardiovascular regulation. Social support predicted better cardiovascular functioning in both men and women, with social resources as a better predictor for men and instrumental support for women. Work-related social support appeared as a weak predictor of cardiovascular functioning, while familial social support was a significantly stronger predictor. The effects of higher social support on better cardiovascular functioning remained consistent in intervention studies; stronger associations were found when interventions involved family sources of support. A similar pattern was found in laboratory studies, though some suggested that effects of social support on cardiovascular reactivity were condition-specific.

N = number of studies reviewed.

that then lead to tumor development and progression (Antoni et al., 2006). However, unlike CVD, there has been less research examining the association between social relations and cancer. In general, there is limited evidence pointing to a relationship between the two. In an early review, it was shown that out of five prospective randomised studies, three showed positive effects of social relations on cancer morbidity (Spiegel, Sephton, Terr, & Stites, 1998). A more recent systematic review of only longitudinal studies found limited evidence for social relations (Garssen, 2004). Although social relations were related to lowered risk in the studies examined, seven studies showed that social relations were significantly related to cancer initiation and progression, whereas seven others did not. Therefore, there is weak evidence that social relations are related to cancer incidence and prognosis.

However, the role of social relationships may be primarily moderated by the severity of cancer. A consistent trend in the literature is that social relations may be particularly protective for cancers with higher survival rates. For instance, according to the National Cancer Institute, the 5-year survival rates for breast cancer were 91.4 per cent whereas lung cancer was 16.7 per cent. A review of 31 prognostic studies showed that the relationship between a lack of social relations and cancer progression was the strongest in breast cancer but weaker in other types of cancers (e.g. lung cancer) (Nausheen, Gidron, Peveler, & Moss-Morris, 2009). Another review also found that variables such as social support and marriage with significant psychosocial components were helpful for the survival of breast cancer patients but not for other forms of cancer or mixed cancers (Falagas et al., 2007). An analysis of cancer studies in which a majority of the studies were of breast cancer patients (20 out of 33 studies) showed that there was a positive association between social relations and prognosis in regard to cancer relapse and survival (De Boer, Ryckman, Pruyn, & Van den Borne, 1999).

There also appear to be preliminary differences between forms of social relations in predicting cancer outcomes. A review of 31 prospective studies showed that social integration was more strongly related to disease progression than social support (Nausheen et al., 2009). In part this may be because a larger network provides a variety of contacts and awareness of cancer-related issues that may encourage medical checkups and general health behaviors—these behaviors may lead to shorter delays in diagnosing and treating cancer, which improves cancer prognosis (see Richards, Westcombe, Love, Littlejohns, & Ramirez, 1999).

A meta-analysis of 45 studies reporting 62 treatment–control comparisons showed that there were beneficial effects of psychosocial treatment on cancer-related symptoms ($d = .26$) (Meyer & Mark, 1995). Interestingly, there was little difference between behavioral interventions, nonbehavioral counseling and therapy, informational and educational methods, or social support organised and provided by other patients. Although this provides some

evidence that social relations may be positively related to cancer outcomes, evidence from longitudinal studies appears to be mixed and more research is required to determine why effects are found and why they are not. Table 9 summarises the papers on this issue.

DISCUSSION

More than two decades ago, Cohen (1988) proposed an agenda for examining social relations with different health indicators. In this review we sought to appraise current evidence on this topic. We found that social relations had differential effects on various health behaviors and outcomes. When social relations are measured with respect to specific health behaviors—which broadly include aspects such as social influence, encouragement, and companionship in engaging target behavior—they are more predictive of health behaviors compared to general measures of support. However, social relations measured in a general manner are associated with health behaviors such as chronic illness self-management, suicide, and self-injury. We posited that it is because social norms may be accounted for by specific measures of social relations but not in general measures.

There is now a growing recognition that network behavioral norms and support can potentially exert opposing or consistent effects in influencing health behaviors (Burg & Seeman, 1994). Not all relationships produce health and wellness. For instance, adolescent substance abuse has been found to be associated with family history of abuse (Wills & Yaeger, 2003). It has been noted that because these negative ties are not accounted for, the positive effect of social relations may actually be larger (Uchino, 2006). Indeed, we found that evidence for general support was mixed, but support for specific behaviors was more likely to predict behavioral outcomes. Aside from using more specific measures of support, we encourage future research to incorporate network behavioral norms when studying social support and health behaviors.

There is evidence that there is a causal effect of social support on mortality and CVD, but evidence is mixed on cancer outcomes. One potential variable that could explain this differential is disease severity and cancer type. We suggest that the prognosis of diseases such as survival rates should be included as potential moderators of social support effectiveness. One clear implication is that social relations can change disease outcomes when they are more malleable. We also speculate that diseases that have higher survival rates have more routine medical screenings (e.g. breast cancer screening). Social relations may also serve an additional role of either increasing awareness or obligating individuals to go for routine medical screenings (e.g. breast cancer screening); consider the case where a mother may feel greater responsibility for taking care of her health than a single woman or when men take

TABLE 9
Social Support and Cancer

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Antoni et al. (2006)	–	Cancer patients	Social support	Narrative review	Social support predicted longer survival in cancer patients. Low social support was related to a 9-fold increase in breast cancer incidence. Higher social support was associated with lower serum levels of VEGF and interleukin-6 (IL-6), both of which promote the growth and migration of tumor cells. High social support was also associated with an increase in the number of natural killer (NK)-cells in breast and ovarian cancer patients, which predicted breast cancer mortality and poor clinical outcome when present in low numbers.
De Boer et al. (1999)	15	Cancer patients	Social integration Social support	Narrative systematic review	7 out of 15 studies reviewed showed that social factors, including high social involvement, high involvement in expressive activities, large social network, presence of more support individuals, close social ties and good adequacy of emotional support, and extensive social support were significantly correlated with longer overall survival in cancer patients. While a similar number of studies showed no significant effect of social factors on survival, no negative associations were found.
Falagas et al. (2007)	31	Breast cancer patients	Social integration Actual and perceived social support	Narrative systematic review	Of 31 studies reviewed, 6 studies showed a significant relationship between actual social support or perceived social support and survival or recurrence in breast cancer patients. However, some evidence contrasted the findings, reporting that higher perceived emotional support predicted a decrease in survival rates.

Garssen (2004)	6	Cancer patients	Social integration Social isolation Perceived social support	Narrative systematic review	6 longitudinal, prospective studies found a relationship between social support and cancer progression. Experience of support, presence of confidants, presence of a sufficient network of friends and relatives, and involvement in organisations predicted longer disease-free intervals and longer survival in cancer patients. Canadian breast cancer patients with at least one type of confidant had a higher survival rate (74%) than patients who did not have any confidants (56%) at a 7-year period. Longer disease-free intervals were observed in recurrent cancer patients with higher perceived social support. Low number of social ties and experience of social isolation predicted higher risk of developing and dying from cancer in women but not men. However, in patient populations, few social ties were related to worsened cancer progression in men but not women.
Meyer & Mark (1995)	45	Adult cancer patients	Social integration Social support	Meta-analysis	A meta-analysis of 45 studies reporting 62 treatment-control interventions revealed that psychosocial interventions—cognitive-behavioral treatment, informational and educational treatments, nonbehavioral counseling or psychotherapy, social support by nonprofessionals, and other treatments—were effective in enhancing functional adjustment (effect size *d* .19), emotional adjustment (effect size *d* .24), and treatment—and disease-related symptoms (effect size *d* .26) in adult cancer patients.
Nausheen et al. (2009)	26	Cancer patients	Social integration Social support	Narrative systematic review	Of the 31 findings from 26 studies that involved 50 to 1,753 participants with cancer at stage I-IV, 7 out of 14 significant findings on structural social support suggested that it was associated with cancer progression, while only 5 out of 17 studies on functional social support reported the same. The beneficial role of social support was found only in the progression of breast cancer, but the same effect was not seen in other forms of cancer.

TABLE 9
Continued

Authors	N	*Sample type*	*Social relation measure(s)*	*Type of review*	*Findings*
Pinquart & Duberstein (2010a) *	87	Cancer patients	Social integration Perceived social support	Meta-analysis	(repeated in mortality summary)
Spiegel et al. (1998)	–	Cancer patients	Social isolation Social integration Emotional social support	Narrative review	Social isolation for women was associated with higher all-cause mortality, cancer related mortality and cancer incidences, with a fivefold increase in hormone-related cancers. Emotional support in the early stages of the disease had a positive influence on survival. Social relationships with a spouse, friends, relatives and neighbors were all associated with longer survival. Social support was purported as the underlying mechanism that mitigated effect of stress on immunity and endocrine activity. Divorced or separated women had lower helper T lymphocytes and NK cells counts; conversely, high perceived social support was associated with alleviated immunosuppression and higher NK cell activity—a strong protection against cancer recurrence.
Uchino et al. (1996)	19	Cancer patients	Social integration Social support	Narrative review	Higher social support predicted better immune functioning. Of 19 correlational studies reviewed, 12 showed a positive relationship between social support level and immune functioning. Cancer patients with emotional support from spouses and doctors had greater NK cell lysis. Other dimensions of social support were also found effective in strengthening immunity of cancer patients, observed through stronger proliferative response to PHA and greater NK cell lysis.

N = number of studies reviewed.

better care of their health when they are married by being more likely to engage in preventive and follow-up health care.

For disease trajectories that are less modifiable via medical treatment, it is not surprising that social support exerts smaller effects. Apart from the inherent immutability, it is also possible that steeper downward trajectories of diseases offer less time for social relations to be fully activated. This further compounds the limitation of social relations on severe diseases. While social relations are often seen as protective factors against diseases, severe diseases in particular may elicit more support. In one study on social support and diabetes, patients received more support from their partners on days when their physical symptoms were more severe. These symptoms served as a signal to their partners who in turn offered greater emotional support (Iida, Seidman, Shrout, Fujita, & Bolger, 2008). Also, a longitudinal study in a group of patients who had undergone radical prostatectomy showed that disease severity positively predicted support provision. Furthermore, positive affect due to lower disease severity and recovery predicted less support provision as well as more reciprocal support provision from patients (Knoll, Burkert, Luszczynska, Roigas, & Gralla, 2011a; Knoll, Burkert, Roigas, & Gralla, 2011b). Therefore, the relation between social support and disease severity is complex, and it is likely that the severity of the disease impacts both the effectiveness of social support and the amount of support received.

We found that differences emerged between social support and social integration in predicting health outcomes. Both social integration and social support were associated with mortality, but complex measures of social integration (e.g. marital status + network size + network participation) were more predictive. Also, there is evidence that low social integration was associated with cancer outcomes whereas social support was more associated with CHD incidence and prognosis. It is difficult to ascertain the conceptual basis for these differences, and the reason may lie in the measurement of these constructs. There are large variations in how social support and social integration are measured. Social support can be measured as: (a) a general sense of support; (b) a summation of different aspects of social support such as emotional support, tangible support, and informational support; (c) different sources of support such as family, friends, or colleagues. Along the same lines, social integration measures may include a range of indices that are not uniform across the literature. Overall, because social relations measured in various ways are positively associated with health, it suggests a robust association.

Limitations and Areas for Future Research

Although the strength of this review is a broad survey of social support in relation to various health behaviors and outcomes, it is also a limitation

because it does not always delineate how specific types of social support relate to health outcomes. In part, the exponential growth of social support and health has limited our focus to review articles and more general aspects of support and health. Nevertheless, our review reveals potential moderators (e.g. social norms and disease severity) that need to be considered, and the areas that need more primary research and focused quantitative reviews to understand distinctions between types of support and health behaviors as shown in Figure 1.

To date, most research on health outcomes has been limited to social integration and social support. However, there are other aspects of social relations such as received support and support provision to others. Received or enacted support is defined as whether support has been provided recently; support provision is the giving of help to others. Both facets are conceptually distinct from social integration and social support (Barrera, 1986; Haber, Cohen, Lucas, & Baltes, 2007). Importantly, the behavioral dynamic of receiving and giving support and its impact on health requires further examination. Received social support is often triggered in times of stress and may not be always helpful (Bolger & Amarel, 2007; Bolger, Zuckerman, & Kessler, 2000). This is because received support incurs an emotional cost and could potentially lower self-esteem and sense of self-efficacy when it is not sought. On the other hand, there is some empirical evidence which suggests that provision of social support may be more helpful than support receipt for mortality outcomes (Brown et al., 2003). Yet, long-term provision of support can be stressful and result in worse health outcomes. Therefore, it is important for more research to determine when and how receiving and supplying support can be beneficial to health.

Because social relations entail both rewards and costs (e.g. Rook, 1984), the linkage between social relations and physical health is not necessarily positive. Social relations can be a source of stress as individuals may provide unwanted or ineffective help or negative interactions (Rook & Pietromonaco, 1987). For example, there is new evidence showing that negative and competitive social interactions reduce physiological functioning (Chiang, Eisenberger, Seeman, & Taylor, 2012). Also, negative interactions may lead to lower mortality in the long run because social control from significant others (e.g. demanding medical adherence) could increase longevity but would be perceived in a negative light (Birditt & Antonucci, 2008). Interestingly, negative and positive aspects of social relations appear to be independent (Revenson et al., 1991). Therefore, our conceptual model presented in Figure 1 can include both positive and negative effects of social relations.

Related to social interactions, there needs to be more focused research into the interaction patterns of individuals. According to Relational Regulation Theory (Lakey & Orehek, 2011), it has been proposed that the main effect of social support on mental health is based on commonplace interactions and

shared activities. More recent research has moved in this direction with regard to physical health. Because it has been found that family support was particularly important to physical health, Rosland, Heisler, and Piette (2011) explored specific family behaviors in relation to several health outcomes. In their review of 22 studies, half of which were longitudinal, they found that family cohesion (e.g. marital cohesion/intimacy, family cohesion amount) and family function (e.g. intimacy, accommodation, respect) was related to lower risk of coronary heart disease. Apart from the use of self-reported behaviors, studies can also examine specific dyadic transactions of communication behaviors (e.g. Cutrona & Suhr, 1994).

In virtually all the social relations studies related to physical health, social support was measured using self-reports. Yet this neglects the interdependent nature of social support. A reliance on self-reports may omit key support transactions. A daily diary study of partners revealed that recipients who were unaware of support provision (reported by their partner) were better adjusted during major stressors (Bolger et al., 2000). Further, self-reports may not account for all the situational factors to accurately assess the availability of support. In a study examining ratings of adolescents and adult informants, only informant social support ratings were significant predictors of postpartum depression scores both concurrently and after 6 weeks, even when statistically controlling for self-ratings (Cutrona, 1989).

Summary and Conclusion

This review of social relations on health behaviors and outcomes found that social support was clearly an important factor for health. Having fewer social relations was associated with poorer chronic illness self-management, increased suicidal and self-injurious behaviors, higher risk for mortality, and the development and advancement of CVD. We also found some potential boundary conditions for the effectiveness of social support. General health behaviors were not consistently associated with general social support because they do not necessarily account for behavioral norms of supporters. Nevertheless, support of specific health behaviors was more predictive of health behaviors. Also, there was less evidence that social support was related to cancer outcomes. There appear to be grounds for including disease severity as a moderator of social relations effectiveness. Future research could incorporate these factors into empirical research and examine other aspects of social relations.

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