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Does Distance Matter in the Age of the Internet?

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Abstract

This study is part of the broad debate about the role of distance and technology for interpersonal contact. To the best of the authors' knowledge, this is the first study that systematically and explicitly compares the role of distance in social networks pre- and post-Internet. An analysis is made of the effect of distance on the frequency of e-mail, phone, face-to-face and overall contact in personal networks, and the findings are compared with their pre-Internet counterpart whose data were collected in 1978 in the same East York, Toronto locality. Multilevel models with a spline specification are used to examine the non-linear effects of distance on the frequency of contact. These effects are compared for both very close and somewhat close ties, and for different role relationships: immediate kin, extended kin, friends and neighbours. The results show that e-mail contact is generally insensitive to distance, but tends to increase for transoceanic relationships greater than 3000 miles apart. Face-to-face contact remains strongly related to short distances (within five miles), while distance has little impact on how often people phone each other at the regional level (within 100 miles). The study concludes that e-mail has only somewhat altered the way people maintain their relationships. The frequency of face-to-face contact among socially close friends and relatives has hardly changed between the 1970s and the 2000s, although the frequency of phone contact has slightly increased. Moreover, the sensitivity of these relationships to distance has remained similar, despite the communication opportunities of the Internet and low-cost telephony.

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Are Cities Losing Their Advantage?

Is the Internet Killing Distance?

Cities have always been interaction maximisers at the crossroads of multiple social networks: compressing people and building channels to increase the efficiency of encounters, planned and happenstance (Meier, 1962; Massey, 1984). While cars, phones and transit stretched interaction and most communication out to the boundaries of metropolitan areas, these media were limited in the speed of travel (cars and transit), what they could communicate (phones) and the cost of communication (cars, transit and phones).

The advent of the Internet has changed the balance between communication and spatial distance, promising to put into effect what Marshall McLuhan (1962) presaged as the 'global village' and Manuel Castells (2000) has called 'the space of flows', where connectivity functions without regard to place. E-mail's social affordances are compelling for communication: high velocity and zero marginal cost above the monthly flat rate; the ability to contact many people at once (and for many to respond to one or to many); the ability of communications to be stored and retrieved later; the lack of visual and audio barriers to making contact; and the ease of contacting, replying and forwarding (Wellman, 1999, 2001). It is almost as easy to communicate with ties (both strong and weak) across the globe as across the street—although time-zone differences still delay some immediate responses.

This fall in the cost of distance for communication has led commentator Frances Cairncross to assert that the Internet has caused "the death of distance"

> friends, colleagues, and customers could easily be anywhere—around the corner or around the world—and the new ways of communicating will effectively wipe out distance as a cost factor, indeed, as a perceptible concept from our lives (1997: synopsis on barnesandnoble.com).

Has the Internet actually killed or—less luridly—weakened the effect of distance on interpersonal relations and, in so doing, helped to reduce a key comparative advantage of cities? There is more speculation than evidence (Green, 2002). Visions of bucolic communicators e-chatting abound, with *Wired* magazine putting on a post-(Leo) Marxist (1964), spin on the new WiFi machine in the garden (Wellman and Gulia, 1999; Fisher and Wright, 2001; Axhausen *et al.*, 2007). At the same time, there has been some worry about increased social isolation (for example, McPherson *et al.*, 2006), with Pope Benedict XVI warning that

> if the desire for virtual connectedness becomes obsessive, it may in fact function to isolate individuals from real social interaction (Benedict XVI, 2009).

Yet, there have not been systematic studies to confront these visions with reality.

Glocalisation

To be sure, the Internet is not the first technological change to affect the relationship of distance to social interactions. Until the advent of the telegraph, transport and communication were tightly coupled, with messages transported by hand. Although the telegraph was the first decoupler in the mid 1800s, its expense and difficulty of use made it suitable only for businesses and government—a person-to-person telegraph was only used for life-changing events, such as marriage, birth, illness or death (Pred, 1973).

In the course of the past 200 years, rail, roads and low-cost airplane flights increased the range of viable interpersonal contact throughout the developed world and increasingly in the less developed world. Where Americans travelled an average of 50 metres per day in 1800, they travel an average of 50 *kilo*metres in the 2000s (Urry, 2007). Getting on an airplane has become more like the experience of taking a bus in the 1950s than the 'swellegant' airline travel of the 1930s.

Communities became 'glocalised' (Hampton and Wellman, 2002)—with extensive long-distance as well as local relationships—so that they were no longer synonymous with neighbourhoods. Well before the coming of the Internet, ties with friends and relatives stretched beyond the neighbourhood. In 1978, in the same East York area of Toronto that we report about in this paper, 73.0 per cent of an adult's socially close ('intimate') ties with friends and relatives went beyond the neighbourhood, with 61.3 per cent going outside the relatively compact borough of East York itself and 42.3 per cent stretching beyond all of metropolitan Toronto (Wellman, 1979). Only 22 per cent of the socially close friends and relatives of residents of the East York area of Toronto lived within a mile of each other, while one-third (33 per cent) lived more than 100 miles away: the median distance apart was 10 miles. No East Yorkers had most of their active ties living within a mile's walking distance (Wellman *et al.*, 1988). Other developed countries had similar situations—for example, northern California (25 per cent within 5 minutes' drive and 35 per cent at least an hour away; Fischer, 1982) and Toulouse, France (28 per cent within 5 minutes' drive and 17 per cent at least an hour away; Grossetti, 2007).

Since the 1940s, the telephone has been the great decoupler of communication from transport. Like the Internet, it allowed instant communication around the world: people no longer had to travel to remain in contact. Early commentators feared it would lead to the death of distance. It did not, although it did incorporate rural folk more fully into broader societies (Fischer, 1992). In general, the telephone democratised access in the developed world. As it became affordable, if you could talk and turn a dial (or speak to an operator), you could use it.

In 1968, our East York research found that people use both face-to-face and telephone contact to maintain their active ties. Moreover, the rate of telephone and face-to-face contact was positively associated: the more people saw each other, the more they spoke on the phone (Wellman, 1979; Wellman and Tindall, 1993; see also Fischer, 1982). Thus, even before the Internet, phoning, driving and flying meant that some

> network travellers [were] ... not form[ing] communities with the neighbours any more [except to] share the same public and semi-public spaces around their front door (Axhausen *et al.*, 2007, p. 1).

Despite this long-distance connectivity, our 1978 data showed that proximity continued to be associated with both face-to-face and phone contact. Telephoning did not fully decouple communication from travel. Those who have phoned the most have seen each other the most and contact by phone as well as by travel declines with distance. The number of friends and relatives in contact has usually decreased with increasing distance. For example, our study of East York in 1978 found two distances where the frequency of contact markedly increased: at 5 miles—effectively a local trip in Toronto; and at 100 miles—a day-trip by car, train or bus (Mok and Wellman, 2007). Even though telephoning enabled communication to be independent from physical contact, phone contact also diminished over distance, although not as swiftly as face-to-face contact. There were multiple reasons: the then-significant expense of long-distance calls, low ability to have caller and receiver available simultaneously and the intertwining of phone and face-to-face contact—with calls used to sustain contact in-between meetings and to arrange future meetings. In practice, phoning and visiting are part of the same social system, rather than being independent arrangements (Mok and Wellman, 2007).

Glocalisation has been, at most, a halfway house on the route to the supposed death of distance. Data from other developed countries show that before and after the advent of the Internet, there have been many nearby ties and

even more contact. For example, in 2005, nearly two-thirds of Zurich residents' socially close ties lived within 25 km, only one-fifth lived more than 100 km away and the number of face-to-face visits dropped exponentially with distance (Frei and Axhausen, 2007; Axhausen *et al.*, 2007). A study of ties in Rotterdam and New Haven found that about 30 per cent are with people living in the same neighbourhood (Blokland and Mitzman, 2003). European and Thai studies have found that the type of relationship is associated with residential distance: the more important and stronger ties tend to live closer to one another (Axhausen *et al.*, 2007; Faust *et al.*, 2000; Chua *et al.*, 2010).

E-mail and Personal Networks

Although the telephone supplemented, rather than replaced, face-to-face contact, what of the Internet, with its greater social opportunities for the death of distance? The evidence to date has suggested that distance still matters. Early North American studies have shown that, even with the advent of e-mail, there is lower overall contact—face-to-face, phone *and* e-mail—with community ties who live further away. Yet, although only a minority of friends and relatives are walking-distance neighbours, there is still 'glocalisation', with frequent e-mail contact with nearby friends and relatives (Stern and Dillman, 2006; Wellman *et al.*, 2006; Quan-Haase and Wellman, 2002; Chen *et al.*, 2002; Boase *et al.*, 2006; Carrasco *et al.*, 2008).

Internet communication has joined the telephone to work synergistically with face-to-face contact in an integrated personal communication system (Boase, 2008; Carrasco *et al.*, 2008; Kenyon and Lyons, 2006; Kim *et al.*, 2007). Frequent e-mail contact with active friends and relatives is associated with frequent telephone and face-to-face contact. Rather than replacing other forms of contact, e-mail intertwines with them in maintaining ties and arranging face-to-face visits and phone chats (Green, 2002; Boase *et al.*, 2006; Wellman *et al.*, 2006; Curtice and Norris, 2007; Stern and Messer, 2009). If someone moves to another city, there is likely to be a modal shift, with e-mail used more extensively to maintain the tie. Yet, people use face-to-face and phone contact more for the initial development of relationships (Hampton and Wellman, 2002, 2003; Shklovski *et al.*, 2008).

The only reliable contrary evidence comes from large-sample Canadian time-use data showing that heavy Internet users spend less face-to-face time with household members as well as friends and relatives (Veenhof *et al.*, 2008). Moreover, some forms of ICTs—instant messenger (IM), mobile phone and mobile texting—are primarily restricted to contact with close ties (Curtice and Norris, 2007; Miyata *et al.*, 2008).

Research Approach

Key Questions

(1) *What is the role of distance in influencing how members of personal networks stay in touch?* Is distance differentially related to e-mail, face-to-face and phone contact? If so, is there a continuous gradient, or do the effects of distance increase (or decrease) non-linearly?

(2) (a) *Do different types of relationships vary in terms of which media they use to communicate at different distances?* (b) *Do the effects of distance vary according to the type of relationship: strong vs less strong; kin vs non-related?* (c) *If so, is there a continuous gradient, or are there non-linear places where the effects of distance increase (or decrease) markedly?* For example, stronger ties may not require as much face-to-face contact. Moreover, as ties with relatives tend to be densely knit in kinship systems, while friendship ties tend to be more discrete relationships, relations with kin may survive greater distances than relations with friends (Wellman, 1990; Wellman and Wortley, 1990). Earlier surveys have used crude distance and contact

categories that have not allowed researchers to ascertain precisely the relationship of distance to contact. By contrast, we use continuous measures.

(3) *Have the effects of distance on fact-to-face and phone contact changed pre- and post-Internet? If so, are the changes similar for different types of role relationship?* Our study uniquely adds a temporal dimension by examining the changing role of distance in influencing face-to-face and phone contact between the 1970s and the 2000s. This is possible because the samples for the third East York study (in 2005) and the second East York study (in 1978) are drawn from the same locality and asked similar questions.

Building on our Pre-Internet Analysis

The present paper, together with an earlier companion study (Mok and Wellman, 2007), addresses these questions. To provide a basis for comparison with the pre-Internet results, we ask similar research questions to those posed in our analysis of the 1978 data (Mok and Wellman, 2007).

In the companion paper, the pre-Internet results showed a marked drop in the frequency of face-to-face contact at about 5 miles; the frequency continued to decrease steadily further away, with substantial declines happening at about 50 miles and 100 miles. The results also showed that distance affected telephone contact differently, with one marked drop at about 100 miles.

The present paper uses 2005 interview data from the third East York study (the Connected Lives study) to estimate similar models of the frequency of e-mail, phone and face-to-face contact between the respondents and their community ties and to compare our results with those from the 1978 data (Mok and Wellman, 2007). We build on the companion paper in two ways.

First, we examine the role of distance in affecting the frequency of e-mail contact, in addition to face-to-face and phone contact. Secondly, we test the non-linear relationship between distance and contact, using a spline specification in a multilevel model. (In the previous paper, the small sample size made an explicit test of non-linearity difficult.) By contrast, most studies of social networks have neglected distance while concentrating on network structure, composition and contents. 'Distance' in such studies has usually referred to network distance: how many links does it take to connect two persons. When network analysts use geographical distance, they often use it crudely as a dichotomous measure, such as asking if ties remain within a neighbourhood or reach beyond it. We broaden the existing studies by treating distance as a continuous measure and testing if distance affects short- and long-distance contact similarly. To do this, we use geographical information science (GIS) techniques to geocode the street address of each respondent and the road intersections of the respondents' ties, measuring straight-line residential distance between the respondent and each community tie.

Methods

Data Collection

Our research is part of the Connected Lives study whose overarching goal is to assess the role of communication media in everyday life and its impact on personal networks. Our analysis is based on four-hour interviews in 2005 with 86 respondents. Using a name generator, interviewers asked respondents (referred to as 'egos') to name other people (referred to as 'alters') with whom ego has a specific connection. After enumerating a set of alters, each ego-respondent described the attributes of these alters and reported on both ego–alter connections and connections between alters (for details, see Hogan *et al.*, 2007 and Carrasco *et al.*, 2008). We asked about two types of socially close 'active' ties that comprise about 10 per cent of the average person's network (Bernard, 2008; Boase *et al.*, 2006; Wellman *et al.* 2006).

—*Very close ties ('intimates')*: people with whom you discuss important matters, regularly keep in touch with or are there for you when you need help (mean = 11.6; median = 10 alters).
—*Somewhat close ties ('non-intimates')*: people who are more than casual acquaintances but not very close (mean = 12.2 alters; median = 10 alters).

This 'closeness' approach not only measures tie strength, it defines the personal network boundary of 'active ties', excluding less close friends and acquaintances. The complete active personal networks ranged between 3 and 66 (the maximum allowed), with a mean of 23.8 alters and a standard deviation of 14.5. The subsample geocoded ranged between 3 and 15, with a mean of 12.1 and a standard deviation of 3.2.

We gathered detailed information in a manner that somewhat privileged stronger very close and somewhat close ties (Hogan *et al.*, 2007). Spatial information was geocoded with 95 per cent success. Respondents reported information about communication and interaction patterns with alters: face-to-face, socialising, telephone and e-mail. Telephone use includes both landline and mobile phones. E-mail use includes instant messaging that was rarely used by these respondents (Wellman *et al.*, 2006).

East York and the East Yorkers

East York, the scene of our case study, is a residential area (population 114240, 2001 census) of Toronto that has been the locale of NetLab's two previous community studies in pre-Internet times: a survey in 1968 (Wellman, 1979) and interviews in 1978 (Wellman and Wortley, 1990). Although it is not feasible to do a third longitudinal wave with the same respondents 25 years later, East York retains its value for comparisons between the pre-Internet and the Internet eras.

East York sits squarely within the arterial highway system of Toronto. It is bounded on the west by an expressway and on the south by a subway line; buses frequently travel main routes. The population is ethnically and socio-economically mixed, residing in working-/middle-class houses and apartment buildings. Mobile phone and broadband Internet service is widely available throughout Toronto, the largest metropolitan area of Canada.

Two demographic changes in East York are relevant. First, East York's population is older now. According to the 2001 census, the median age in East York was 37.4 years, while in both 1976 and 1981, the median age was 30 years. Secondly, recent immigration and high-rise apartment development have made the East York cityscape more complex than its village-like past. Previously in 1978, almost all East Yorkers were Canadian born or of British Canadian ethnicity. In the 2000s, East York is similar to much of the metropolitan Toronto area in its percentage of foreign-born residents. Fifty-three per cent of East York residents were Canadian born in 2001, similar to the 58 per cent of the interview respondents. Visible minorities (i.e. non-White Canadians) are principally east Asians and south Asians. Their ethnic groups are underrepresented in the present study because of language and cultural barriers. In most other respects, our data reflect census demographics, including gender, age, income, education and family composition (Gram *et al.*, 2009).

East Yorkers vary in their Internet use. Heavy Internet users have lived in Toronto and their current homes for a shorter period than those who do not use the Internet.[1] On the other hand, a greater proportion of heavy users are immigrants, compared with non-users. Among these immigrants, heavy users entered Canada more recently than non-user immigrants did, and they use the Internet to keep in contact with friends and relatives in their homelands.

Distance and Mode of Communication

The number of alters with respect to distance generally declines until a slight rise at far transoceanic distances (Figure 1). The number of alters drops by 45.4 per cent when distance

increases to between 4 and 8 miles; it falls by another 50.0 per cent when distance increases to between 8 and 12 miles, a geographical scope that is beyond the boundary of East York. The number of alters levels off at less than 20 beyond 20 miles at the regional level

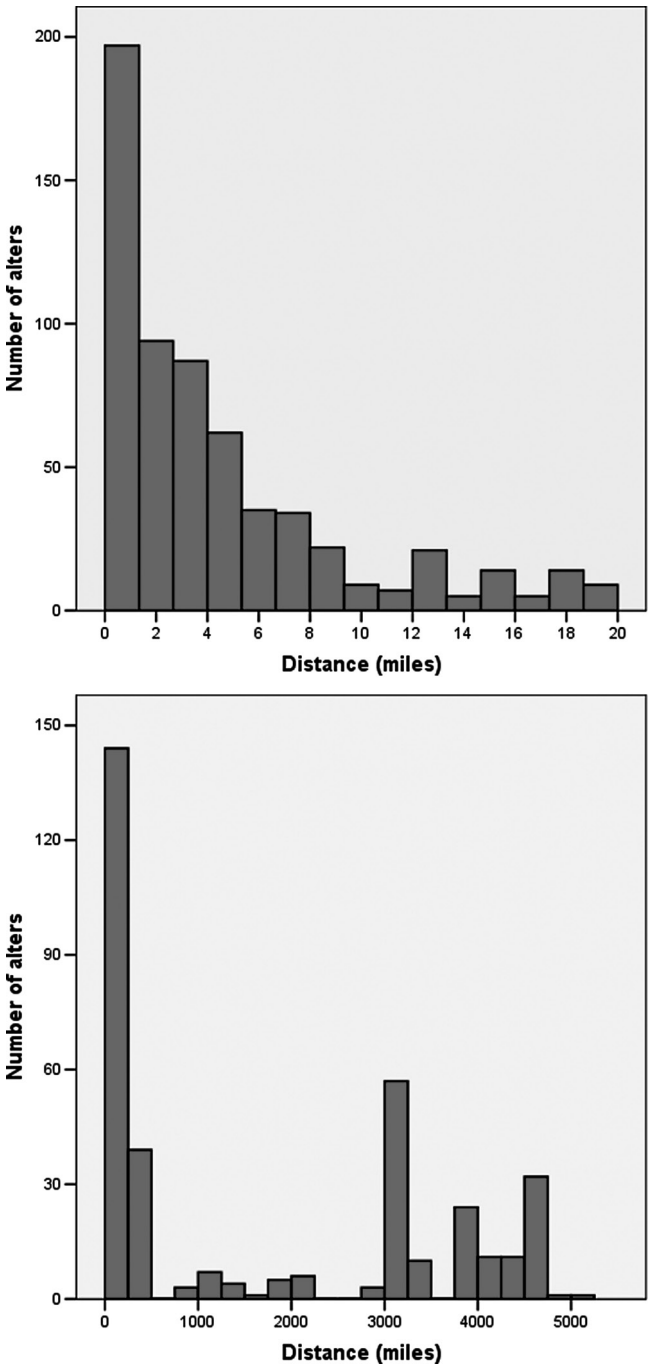

Figure 1. Number of alters by distance: (above) alters located within 20 miles; (below) alters located beyond 20 miles.

and then rises again when distance becomes transoceanic, beyond 3000 miles.

Figure 2 shows the scatterplots of the frequency of e-mail contact within 500 miles, between 500 and 3000 miles and beyond 3000 miles. Figure 3 shows the scatterplots for phone contact (0–100 miles and 100–500 miles, as well as beyond 500 miles) and Figure 4 shows the scatterplots for face-to-face contact (0–5 miles and 5–50 miles, 50–500 miles, and beyond 500 miles).

The mean frequency of e-mail is highest within 50 miles, at 142.5 times a year. It drops by 45.2 per cent to 78.1 times for distances between 50 and 500 miles and further by 25.6 per cent to 58.1 times a year for distances between 500 and 3000 miles; it then increases to 106.2 times a year beyond 3000 miles. These numbers suggest that distance and e-mail contact are related to one another non-linearly. Heavy users are more involved in longer-distance relationships than non-users: both the mean and the median distance among heavy users are 2.0 times longer than for non-users. Heavy users have more extended kin (aunts, cousins, etc.) in

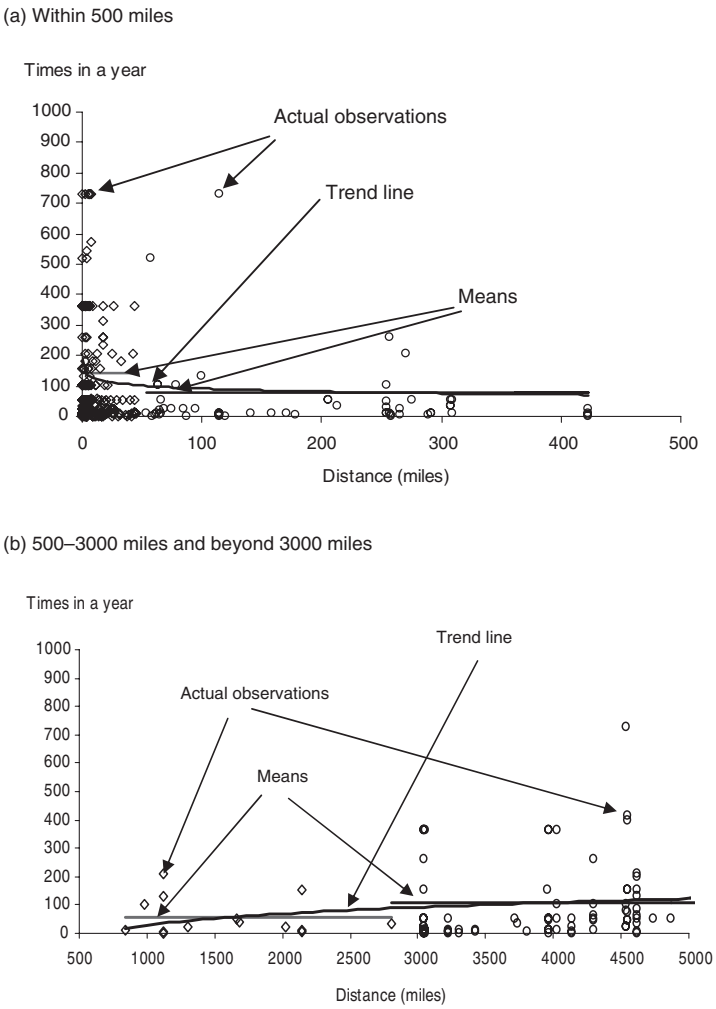

Figure 2. Scatterplot of frequency of e-mail/instant message contact by distance.

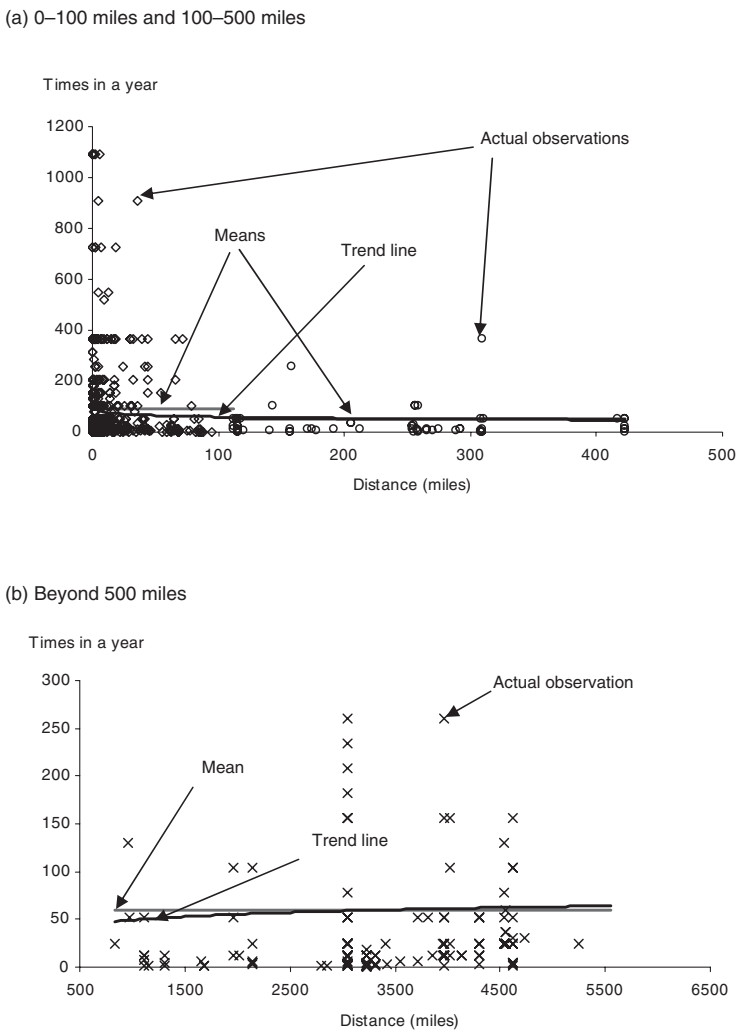

Figure 3. Scatterplot of frequency of phone contact by distance.
Note: The trend lines are flat lines almost overlapping with the means. They are excluded for clarity purposes.

their active networks than non-users, but a smaller proportion of neighbours. (All role relationships are self-identified.)

Phone contact and distance also have a non-linear relationship. The mean frequency of contact within 100 miles is 89.9 times a year. It decreases by 42.7 per cent to 51.5 times a year, when distance is 100–500 miles. It then increases slightly to reach 59.4 for distance greater than 500 miles.

Meanwhile, face-to-face contact drops monotonically with distance. The mean frequency falls from 82.3 times a year (more than weekly) within 5 miles to only 54.0 times (5–50 miles). It further declines by one-third to 21.8 times a year when distance is 50–200 miles and 6.6 times (once every two months) when distance is 200–500 miles. Beyond 500 miles, respondents meet their active ties 3.8 times a year.

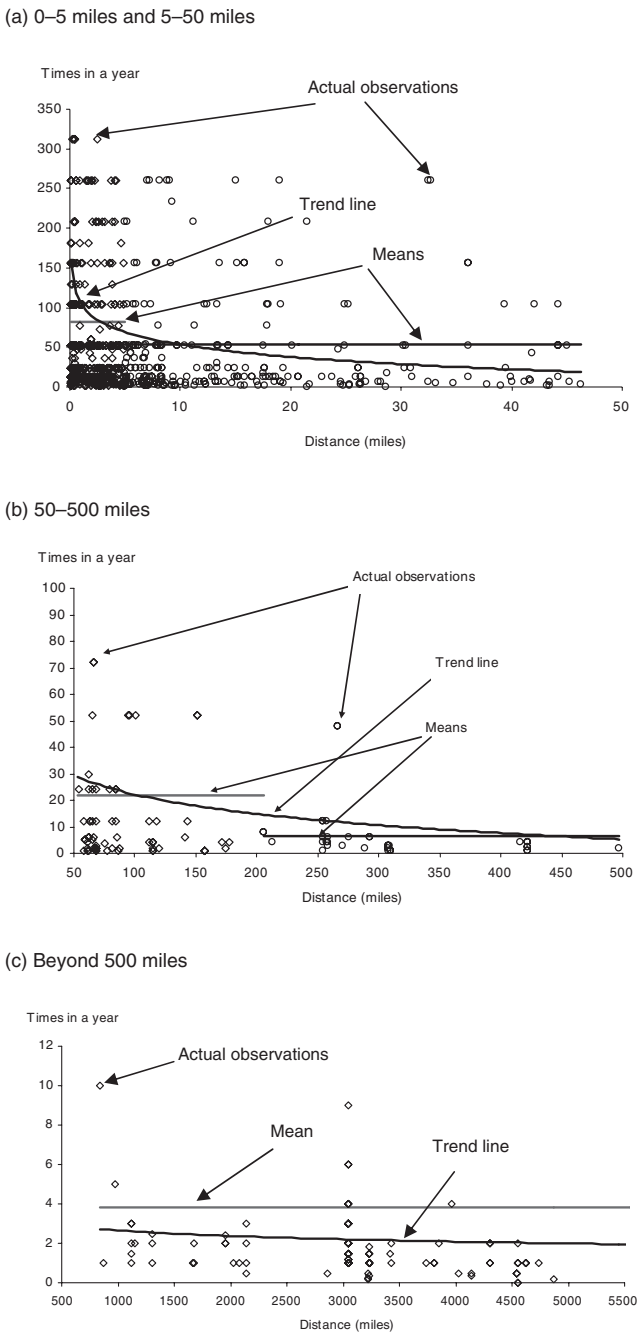

Figure 4. Scatterplot of frequency of face-to-face contact by distance.

Figures 5, 6 and 7 present a complementary view of the relationship between distance and mode of communication. Despite the widespread prevalence of e-mail, about 60 per cent of the alters living within 3000 miles are *never* in contact with the East Yorkers by e-mail. This percentage changes substantially for distance greater than 3000 miles, where only 45 per cent

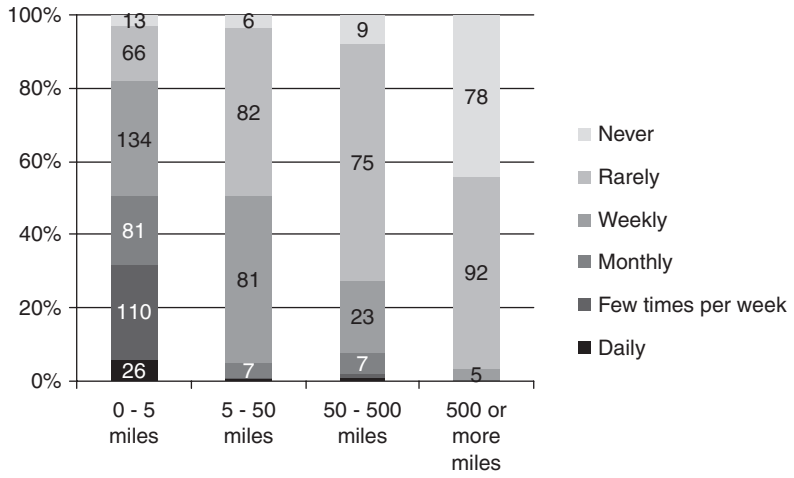

Figure 5. Frequency of face-to-face contact by distance.

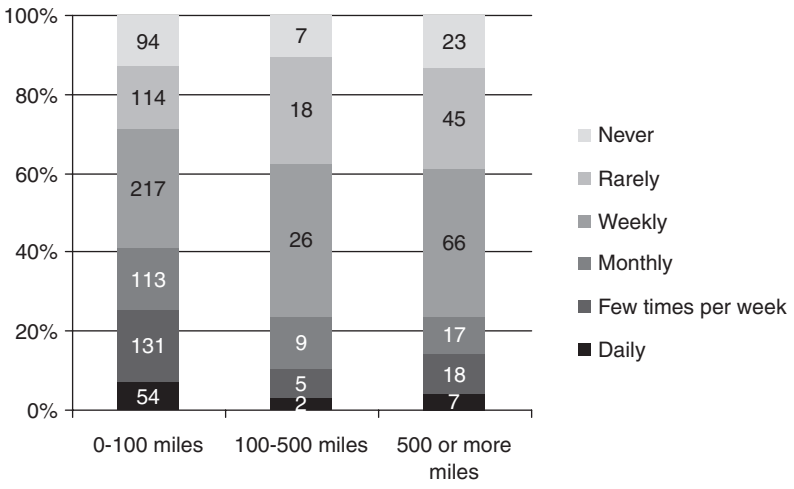

Figure 6. Frequency of phone contact by distance.

of the alters are never in contact by e-mail. As discussed before, heavy use of e-mail (weekly or more frequently) is proportionally higher for distances greater than 3000 miles. Phone contact frequency tends to be higher for distances within 100 miles. At the same time, the proportion of contact that never takes place by phone is almost invariant with respect to distance. Finally, face-to-face frequency of contact shows a marked drop with respect to distance, consistent with the previous results presented in this section.

Analytic Models

We divide the sample of socially close alters in two ways. One way is by role relationship: immediate kin, extended kin, friends and neighbours. The second way is by intimacy: those who are very close ('intimates') and those who are somewhat close ('non-intimates'). Because intimacy is not independent of kinship, we then interrelate intimacy by role relationship. All relationships are self-identified by

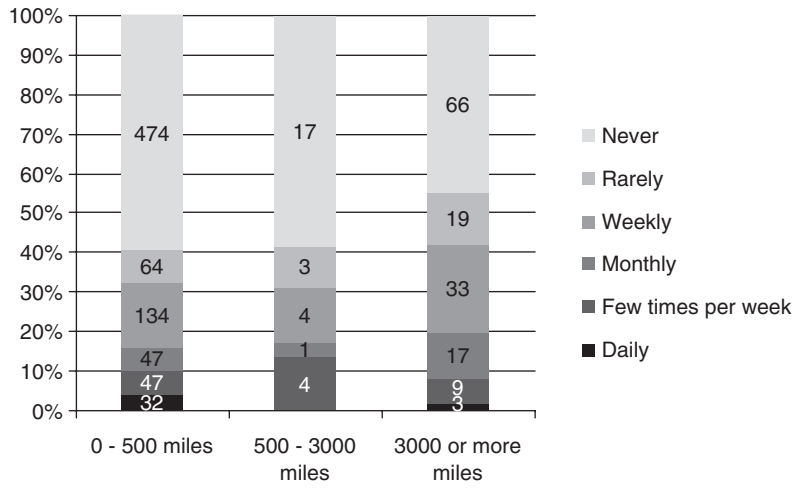

Figure 7. Frequency of e-mail contact by distance.

the respondents and include only those alters living outside the respondents' households.

The analysis involves four models, each focusing on a different mode of contact

—*Model 1*: frequency of e-mail contact.
—*Model 2*: frequency of phone contact.
—*Model 3*: frequency of face-to-face contact.
—*Model 4*: frequency of overall contact.

In all four models, we estimate a multilevel model to control for the network structure of the data by grouping community ties by their corresponding respondent (see Wellman and Frank, 2001). Following our previous study, we estimate a simplified version of the multilevel model. The simplified version assumes that the slope is deterministic and that only the intercept varies at the respondent level. This simplification allows us to focus on how the slope parameter may vary by the different types of role relationship and tie strength. Our basic estimating equation is

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \gamma_{10} X_{ij} + \gamma_{11} Z_j X_{ij} + u_i + \varepsilon_{ij} \quad (1)$$

The subscript i refers to the respondent; the subscript j refers to the community tie. The dependent variable Y_{ij} is quantitative (frequency of contact) and X_{ij} is the set of explanatory variables (for example, residential distance between the respondent and the tie) affecting Y_{ij}, with X_{ij} being measured at the tie level. Note that Z_j is a vector that describes the characteristics of respondent j; u_i and ε_{ij} are the errors at the respondent and the tie level respectively.

The estimating equation (1) is expanded to include a spline specification. A spline specification linearly segments the regression line, allowing the line segments to have different slope estimates. In the simplest case, suppose the data suggest a single knot (cusp point between two line segments) at distance k_d, which divides the data into two sub-samples. We further assume that Z_j affects the two line segments similarly. Let $d = 1$ if $X_{ij} \geq k_d$. These assumptions provide the estimating equation for the spline model (see online version for a detailed derivation)

$$Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d \left(X_{ij} - k_d\right) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij} \quad (2)$$

We estimate equations (1) and (2). Our discussions first focus on the spline models that test if the various linear segments possess different slopes. (We do not use spline models to analyse 'neighbours' because only three live further than five miles away.) The slopes may differ because the dynamics of travel and communication can be non-linear. For example, an overnight trip of 100 miles has more in common with one of 150 miles than it does with a short drive of 50 miles.

In the spline specification, the knots for each mode of contact are based on prior scatterplots and experimentation with the knot positions that would maximise the log-likelihood function. For e-mail contact, three knots are at 50, 500 and 3000 miles; for phone contact, two knots are at 100 and 500 miles; for face-to-face contact, three knots are at 5, 50 and 200 miles.

The dependent variables in all four models are the frequency of e-mail, phone, face-to-face and overall contact. Overall contact refers to the sum of all types of contact. All frequencies are measured in times per year and are transformed by the natural logarithm, as small increases in frequency are more important for rare contact than for very frequent contact. Because of a large number of null responses for e-mail, model 1 focuses on positive frequencies only. As a result, the number of observations in model 1 reduces from 1052 to 461.

In all four models, the key independent variable is the natural logarithm of the residential distance between the respondent and the network tie, using the same reasoning as for frequency. The slope parameter is interpreted as the percentage change in the frequency of contact for each percentage change in distance. To control for potential bias due to the presence of co-workers who meet face-to-face frequently for long hours daily, we have recoded their distance to zero.

One might believe that immigrant respondents in the sample ($n = 452$) are more likely to be involved in long-distance relationships than non-immigrants. Therefore, contacts between immigrants and their community ties could be less sensitive to—or even increase—with distance. To investigate this potential difference between immigrants and non-immigrants, we introduce two covariates into our model. The first covariate is a dichotomous variable that identifies immigrants in the sample—that is, the variable receives a one if the respondent is an immigrant and a zero otherwise. The parameter estimate of this dichotomous variable would allow us to test explicitly if immigrants have more contact than non-immigrants. The second variable cross multiplies this dichotomous variable with the residential distance between the respondent and his/her community tie. The parameter of this variable allows us to test if immigrants are more or less sensitive to distance than non-immigrants when contacting their community ties.[2]

In general, our results show that contacts between immigrants and their community ties are not statistically different from those of non-immigrants.[3] The parameter for the dichotomous variable that identifies immigrants in the sample receives insignificant estimates in most of the models; the parameter for the crossed variable (between the dichotomous variable and residential distance) also receives insignificant estimates. The exception is e-mail contact among extended kin: immigrants are less sensitive to distance than non-immigrants when e-mailing their extended kin.

How Communication Mode and Distance Affect Contact

E-mail Contact (Model 1)

The evidence (Tables 1–4) shows that, although e-mail weakens the negative effects of distance on contact, distance has not died. Overall, the respondents e-mail their active ties 70.1: [exp(4.25)] times a year. Most

Table 1. Model 1 results, with spline: e-mail/instant message contact, single classification

				Kinship				*Not related*				*Intimacy*			
		Overall (n = 461)		*Immediate kin (n = 90)*		*Extended kin (n =51)*		*All (n = 320)*		*Friends (n = 268)*		*Intimates (n = 254)*		*Non-intimates (n = 207)*	
	Knots (miles)	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intercept		**4.25**	0.20	**4.46**	0.62	**5.43**	1.25	**4.16**	0.22	**4.24**	0.25	**4.45**	0.29	**4.01**	0.28
Ln*Dist*		**−0.20**	0.05	**−0.29**	0.13	***−0.50***	0.28	**−0.15**	0.06	**0.20**	0.06	**−0.21**	0.07	**−0.16**	0.07
*d1**(Ln*Dist*-k_{d1})	50	0.08	0.21	0.21	0.46	0.77	0.82	0.01	0.25	0.08	0.24	0.02	0.28	0.28	0.34
*d2**(Ln*Dist*-k_{d2})	500	0.02	0.41	−0.73	0.91	−0.81	1.25	0.41	0.50	0.37	0.48	0.09	0.52	−0.26	0.66
*d3**(Ln*Dist*-k_{d3})	3000	0.90	0.92	3.02	1.94	2.50	2.52	−0.77	1.21	−0.76	1.16	***2.01***	1.16	−0.73	1.46
RIMM		**−0.83**	0.28	0.94	0.78	−1.89	1.78	**−0.73**	0.30	**−1.08**	0.34	−0.56	0.41	**−0.81**	0.38
*RIMM**Ln*Dist*		**0.13**	0.05	**0.30**	0.14	0.12	0.23	0.08	0.05	**0.16**	0.06	0.09	0.07	0.08	0.07
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**		**0.00**	0.00
IT var		**2.82**	0.19	**2.47**	0.38	**3.14**	0.67	**2.74**	0.22	**2.41**	0.21	**2.68**		**2.83**	0.28
-2LL		1796.60		335.70		195.30		1238.20		1003.50		977.00		806.60	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\ (X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$, where Y_{ij} measures the frequency of contact; X_{ij} is the residential distance (Ln*Dist*) between the respondent and the community tie; and Z_j is a dichotomous variable that identifies immigrant respondents (*RIMM*) in the sample. The variable d is a dummy variable that identifies observations whose distance is greater than the knot k_d. The terms u_{0j} and ε_{ij} are the errors of the model. *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 2. Model 1 results, with spline: e-mail/instant message contact, intimates and non-intimates

		Kinship				*Not related*			
		Immediate kin		*Extended kin*		*All*		*Friends*	
	Knots (miles)	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intimates									
Intercept		**4.53**	0.50	**5.86**	1.69	**4.28**	0.34	**4.26**	0.38
Ln*Dist*		**–0.35**	0.13	–0.53	0.38	–0.10	0.09	–0.11	0.10
*d1**(Ln*Dist-*k_{d1})	50	0.47	0.49	0.56	1.03	–0.34	0.36	–0.28	0.34
*d2**(Ln*Dist-*k_{d2})	500	–0.89	0.98	–0.30	1.49	0.70	0.69	0.53	0.64
*d3**(Ln*Dist-*k_{d3})	3000	3.00	1.89	4.52	2.96	0.98	1.91	0.81	1.76
RIMM		–0.66	0.76	–1.51	1.97	–0.45	0.51	**–1.13**	0.54
*RIMM**Ln*Dist*		***0.25***	0.14	–0.04	0.29	0.05	0.10	0.16	0.10
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**2.23**	0.36	**2.68**	0.79	**2.78**	0.34	**2.28**	0.31
-2LL		304.70		104.10		541.60		430.10	
N		84		30		140		117	
Non-intimates									
Intercept		–	–	**5.09**	2.16	**4.01**	0.27	**4.13**	0.33
Ln*Dist*		–	–	–0.50	0.51	**–0.17**	0.07	**–0.22**	0.08
*d1**(Ln*Dist-*k_{d1})	50	–	–	2.01	3.79	0.35	0.37	0.21	0.37
*d2**(Ln*Dist-*k_{d2})	500	–	–	–2.89	6.83	–0.09	0.74	0.11	0.74
*d3**(Ln*Dist-*k_{d3})	3000	–	–	0.48	5.68	–1.31	1.56	–1.34	1.57
RIMM				–10.16	28.53	***–0.73***	0.37	**–0.91**	0.43
*RIMM**Ln*Dist*				0.92	2.77	0.05	0.07	0.11	0.08
IR var		–	–	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		–	–	**4.59**	1.74	**2.61**	0.28	**2.46**	0.29
-2LL		–	–	70.40		686.40		567.00	
N		6		21		180		151	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\ (X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

importantly, the frequency of e-mail contact drops slowly over distance: for each 1 per cent increase in distance, the frequency declines by 0.2 per cent. However, for longer-distance relationships, distance exerts a negligible impact on the frequency of e-mail contacts. Particularly, e-mail contacts among immigrants are much less sensitive to distance. For each 1 per cent increase in distance, frequency drops by 0.1 per cent only.[4]

The mean frequency of e-mail contact is highest among extended kin (228.1 times per year), followed by immediate kin (86.5 times: parents and adult children, including in-laws) and much less often by neighbours (76.7) and friends (69.4). E-mail contact is

Table 3. Model 1 results, without spline: e-mail/instant message contact, single classification

			Kinship				*Not related*						*Intimacy*			
	Overall (n = 461)		*Immediate kin (n = 90)*		*Extended kin (n = 51)*		*All (n = 320)*		*Friends (n = 268)*		*Neighbours (n = 16)*		*Intimates (n = 254)*		*Non-intimates (n = 207)*	
	Estimate	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intercept	**4.13**	0.19	**4.28**	0.59	**4.30**	0.76	**4.07**	0.20	**4.08**	0.23	**4.34**	0.81	**4.33**	0.27	**3.95**	0.25
Ln*Dist*	**−0.15**	0.04	**−0.23**	0.10	***−0.21***	0.12	**−0.12**	0.04	**−0.14**	0.05	0.56	0.50	**−0.17**	0.05	**−0.13**	0.05
RIMM	**−0.91**	0.28	−0.98	0.76	−2.70	1.67	**−0.77**	0.30	−0.12	0.33	−0.32	1.37	**−0.88**	0.40	**−0.78**	0.37
*RIMM**Ln*Dist*	**0.18**	0.05	**0.33**	0.12	0.27	0.20	***0.10***	0.06	**0.18**	0.06	0.10	1.21	**0.21**	0.06	0.07	0.07
IR var	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var	**2.85**	0.19	**2.49**	0.38	**3.10**	0.64	**2.74**	0.22	**2.42**	0.21	**5.80**	2.37	**2.77**	0.25	**2.80**	0.28
-2LL	1801.60		342.30		203.30		1240.40		1006.70		64.00		988.20		808.70	

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 4. Model 1 results, without spline: e-mail/instant message contact, intimates and non-intimates

	Kinship				*Not related*					
	Immediate kin		*Extended kin*		*All*		*Friends*		*Neighbours*	
	Estimate	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intimates										
Intercept	**4.20**	0.57	**4.68**	1.10	**4.31**	0.32	**4.31**	0.34	–	–
Ln*Dist*	**–0.24**	0.10	–0.23	0.17	***–0.12***	0.07	**–0.14**	0.07	–	–
RIMM	–0.75	0.76	***–3.31***	1.82	–0.68	0.50	**–1.33**	0.53		
*RIMM**Ln*DIST*	**0.32**	0.12	0.34	0.23	0.13	0.09	**0.22**	**0.09**		
IR var	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	–	–
IT var	**2.32**	0.37	**2.84**	0.79	**2.81**	0.34	**2.28**	0.30	–	–
-2LL	313.70		115.60		548.00		434.70		–	–
N	84		30		140		117		10	
Non-intimates										
Intercept	–	–	**3.98**	1.13	**3.91**	0.26	**3.93**	0.30	–	–
Ln*Dist*	–	–	–0.20	0.17	**–0.12**	0.06	**–0.15**	0.06	–	–
RIMM			0.95	8.79	***–0.72***	0.37	**–0.88**	**0.43**		
*RIMM**Ln*Dist*			–0.13	0.89	0.05	0.07	0.11	**0.08**		
IR var	–	–	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	–	–
IT var	–	–	**3.91**	1.34	**2.59**	0.28	**2.46**	0.29	–	–
-2LL	–	–	82.30		690.00		571.30		–	–
N	6		21		180		151		6	

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

insensitive to distance, with a slope parameter estimated to range between -0.29 and -0.15. The exception is friend, whose e-mail contact increases with distance. The slope has an estimate of 0.2, meaning that for each 1 per cent increase in distance, e-mail contact increases by 0.2 per cent [exp(0.2)-1]. None of the three knots at 50, 500 and 3000 miles is significant.

Intimates e-mail each other 1.6 times more often (a mean of 85.6 times per year) than non-intimates (55.1 times a year). E-mail contacts among intimates are more sensitive to distance than non-intimate e-mail contact. For each 1 per cent increase in distance, the frequency of e-mail and message contact declines by 0.2 per cent. However, none of the knots receives a significant estimate.

Intimates. Intimate extended kin e-mail each other most often (almost daily), 3.8 times more often than intimate immediate kin do (92.8 times); however, we are mindful that the group of intimate extended kin constitutes a small sample size of 30.

Almost all parameter estimates for distance and the knots are insignificant except for intimate immediate kin, whose frequency of e-mails decreases as distance increases. Among intimate immediate kin, the frequency drops by 0.3 per cent (at the 0.05 significance level) for each 1 per cent increase

in distance, but it rises by 8.3 per cent for those immediate kin who live further than 3000 miles away from each other.

Non-intimates. Only six of the small number of non-intimate immediate kin e-mail each other, a sample size too small for valid statistical estimates. Non-intimate extended kin e-mail each other the most frequently: 162.4 times a year, mindful of the relatively small sample size of 21. This number is about half as frequent as the high frequency of their intimate counterparts. Their e-mail contact is not sensitive to distance. None of the knots receives a significant estimate.

Non-intimate friends e-mail each other at a mean of 40.8 times a year, a mean that is less often than intimate friends do (70.8).

Overall, e-mail contact among non-intimates is insensitive to distance for kin. By contrast, the frequency of contact with friends decreases at a rate of 0.2 per cent.

Phone Contact (Model 2)

Phone contacts (Tables 5–8) decline with distance non-linearly, with a marked drop at the 100-mile cusp point and a slight increase beyond 500 miles. Overall, respondents are in phone contact with their active ties 19.3 times a year. Within 100 miles, the frequency of phone contact hardly drops (the slope is insignificant); beyond 100 miles, it declines at 0.5 per cent. The other knot at 500 miles is significant at the 10 per cent level, implying that phone contacts increase at a rate of 0.1 per cent beyond 500 miles.

Immediate kin phone the most often—a mean of 116.7 times a year. Extended kin phone 38.1 times a year. Friends call more often (21.1) than neighbours (16.0). Intimates phone more often (39.6) than non-intimates (9.6). The frequency of phone contact drops at a different rate among different role relationships. Phone contacts among extended kin are more sensitive to distance than immediate kin contacts. The slope estimates are -0.3 and -0.2 for extended kin and immediate kin respectively. Contacts are insensitive to distance among those who are not related. Phone contacts among intimates are sensitive to distance only beyond 100 miles, at which point contacts drop at a rate of 0.5 per cent; beyond 500 miles, phone contacts increase at a rate of 0.2 per cent.

Intimates. Frequency of phone contact is highest among intimate immediate kin, who call 120.3 times a year (more than twice a week). Intimate extended kin have the second-highest frequency of 48.4 times a year (slightly less than once a week), followed by intimate friends (38.5) and neighbours (32.1).

Phone contact is generally insensitive to distance among intimate role relationships, except for immediate kin. Among immediate kin, phone contact drops smoothly over distance at a rate of 0.1 per cent.

Non-intimates. Non-intimate immediate kin phone most often (58.6 times a year), while non-intimate extended kin phone about half as often (30.3 times); non-intimate friends call each other 11.6 times a year, while non-intimate neighbours call the least often (8.6 times a year).

Phone contact is sensitive to distance for non-intimate extended kin only: their phone contact drops at a rate of 0.3 per cent.

Face-to-face Contact (Model 3)

The respondents meet their active ties face-to-face an average of 50.4 times a year. The frequency drops by 0.2 per cent for each 1 per cent increase in distance. All three knots are insignificant.

The mean frequency of face-to-face contact differs by role relationship. Immediate kin meet an average of 74.4 times a year; neighbours meet the second most frequently (72.2 times a year). Extended kin and friends meet 42.5 and 38.9 times a year respectively. Intimates meet more often (50.9 times per year) than non-intimates (49.4 times).

Table 5. Model 2 results, with spline: phone contact, single classification

				Kinship				*Not related*				*Intimacy*			
		Overall (n = 1052)		*Immediate kin (n = 193)*		*Extended kin (n = 149)*		*All (n = 710)*		*Friends (n = 552)*		*Intimates (n = 558)*		*Non–intimates (n = 494)*	
	Knots (miles)	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intercept		**2.96**	0.13	**4.76**	0.36	**3.64**	0.47	**2.77**	0.14	**3.05**	0.17	**3.68**	0.16	**2.26**	0.16
Ln*Dist*		−0.01	0.03	**−0.17**	0.07	**−0.25**	0.10	0.01	0.04	−0.06	0.04	−0.03	0.04	−0.02	0.04
*d1**(Ln*Dist*-k_{d1})	100	**−0.60**	0.25	−0.08	0.43	−0.26	0.55	−0.52	0.33	0.29	0.33	**−0.75**	0.29	−0.49	0.36
*d2**(Ln*Dist*-k_{d2})	500	***0.69***	0.42	−0.20	0.70	1.00	0.90	0.47	0.57	0.21	0.55	**1.00**	0.49	0.42	0.62
RIMM		−0.08	0.18	**−1.46**	0.49	0.46	0.62	0.05	0.21	0.03	0.24	0.32	0.25	−0.09	0.23
*RIMM**Ln*Dist*		**0.09**	0.04	**0.25**	0.08	−0.04	0.09	0.02	0.05	0.03	0.05	0.02	0.05	0.04	0.05
IR var		**0.01**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**3.11**	0.14	**2.05**	0.21	**2.33**	0.28	**3.29**	0.18	**2.94**	0.18	**2.56**	0.15	**2.55**	0.16
-2LL		4178.50		679.70		553.50		2869.10		2169.60		2104.60		1872.50	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\,(X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 6. Model 2 results, with spline: phone contact, intimates and non-intimates

		Kinship				*Not related*			
		Immediate kin		*Extended kin*		*All*		*Friends*	
	Knots (miles)	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intimates									
Intercept		**4.79**	0.35	**3.88**	0.60	**3.47**	0.19	**3.65**	0.22
Ln*Dist*		**−0.14**	0.07	−0.12	0.13	−0.02	0.05	−0.03	0.05
*d1**(Ln*Dist*-k_{d1})	100	−0.24	0.42	***−1.35***	0.72	−0.68	0.43	−0.62	0.40
*d2**(Ln*Dist*-k_{d2})	500	−0.10	0.70	**2.65**	1.17	0.86	0.73	0.63	0.69
RIMM		**−1.31**	0.50	0.02	0.74	**0.77**	0.32	***0.55***	0.33
*RIMM**Ln*Dist*		**0.25**	0.08	0.02	0.11	−0.06	0.07	−0.03	0.06
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**1.86**	0.21	**1.57**	0.28	**2.99**	0.24	**2.50**	0.22
-2LL		584.30		229.20		1258.30		961.20	
N		171		69		318		254	
Non-intimates									
Intercept		**4.07**	1.50	**3.41**	0.58	**2.16**	0.18	**2.45**	0.23
Ln*Dist*		−0.34	0.29	**−0.35**	0.12	0.03	0.05	−0.04	0.06
*d1**(Ln*Dist*-k_{d1})	100	1.70	1.33	0.58	0.65	−0.67	0.47	−0.53	0.47
*d2**(Ln*Dist*-k_{d2})	500	−2.38	2.04	−0.64	1.08	0.65	0.80	0.61	0.79
RIMM		−1.26	1.47	0.40	0.78	−0.09	0.25	−0.18	0.30
*RIMM**Ln*Dist*		0.14	0.23	0.04	0.12	0.03	0.06	0.06	0.06
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**1.65**	0.58	**1.99**	0.33	**2.68**	0.19	**2.49**	0.21
-2LL		68.50		284.10		1503.50		1121.30	
N		22		80		392		298	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\,(X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 7. Model 2 results, without spline: phone contact, single classification

				Kinship					
	Overall (n = 1052)			*Immediate kin (n = 193)*			*Extended kin (n = 149)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**3.09**	0.12	4.12	**4.90**	0.33	3.95	**3.33**	0.36	−0.39
Ln*Dist*	**−0.07**	0.02	−1.81	**−0.21**	0.06	−1.30	**−0.17**	0.06	1.63
RIMM	−0.06	0.18		**−1.30**	0.47		0.37	0.61	
RI*MM**Ln*Dist*	0.04	0.03		**0.19**	0.07		0.02	0.08	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**3.15**	0.14		**2.05**	0.21		**2.36**	0.28	
-2LL	4185.6			680.6			557.5		

Table 7. *(Continued)*

	Not related								
	All (n = 710)			*Friends (n = 552)*			*Neighbours (n = 69)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**2.87**	0.14	3.76	**3.14**	0.16	–2.23	**2.77**	0.34	0.07
Ln*Dist*	0.04	0.03	2.59	**–0.09**	0.03	5.34	0.22	0.16	1.66
RIMM	0.10	0.21		0.05	0.24		0.25	0.54	
*RIMM**Ln*Dist*	–0.01	0.04		0.01	0.05		0.06	0.24	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**3.32**	0.18		**2.95**	0.18		**4.37**	0.77	
-2LL	2874.1			2170.3			297.5		

	Intimacy					
	Intimates (n = 558)			*Non intimates(n = 494)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**3.84**	0.15	0.93	**2.38**	0.16	2.35
Ln*Dist*	**–0.10**	0.03	1.11	**–0.07**	0.03	–1.76
RIMM	0.34	0.24		–0.06	0.23	
*RIMM**Ln*Dist*	0.01	0.04		0.01	0.04	
IR var	**0.00**	0.00		**0.00**	0.00	
IT var	**2.58**	0.16		**2.57**	0.16	
-2LL	2110.4			1876.9		

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level. The column *SEY-t* shows the t-statistics for comparing the parameter estimates reported in the second East York study.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Not surprisingly, face-to-face contact is the contact medium that is most sensitive to distance. Face-to-face contact drops smoothly over distance at a rate of 0.2 per cent and all knots are insignificant, except for extended kin. Among extended kin, face-to-face contact is not sensitive to distance within 5 miles; but the frequency drops markedly beyond 5 miles at a rate of 0.4 per cent. Contact among non-intimates drops three times as quickly over distance as that of intimates.

Intimates. Intimate immediate kin understandably meet face-to-face the most often: 80.6 times a year (slightly less than twice a week). Intimate neighbours meet 52.5 times a year, followed by intimate friends (48.4), with intimate extended kin meeting the least often (9.2).

The frequency of face-to-face contact among all intimate role relationships is sensitive to distance, dropping at a rate of 0.2 per cent. Extended kin show a different pattern. The frequency shows a marked drop at the 5-mile cusp point: within 5 miles, the frequency drops at a rate of 0.4 per cent; beyond 5 miles, the rate of decline reaches 0.8 per cent.

Table 8. Model 2 results, without spline: phone contact, intimates and non–intimates

	Kinship						*Not related*								
	Immediate kin			*Extended kin*			*All*			*Friends*			*Neighbours*		
	Estimate	*S.E.*	*SEY–t*	*Estimate*	*S.E.*	*SEY–t*	*Estimate*	*S.E.*	*SEY–t*	*Estimate*	*S.E.*	*SEY–t*	*Estimate*	*S.E.*	*SEY–t*
Intimates															
Intercept	**5.00**	0.33	2.43	**4.00**	0.43	–	**3.57**	0.19	0.75	**3.80**	0.21	−1.01	**3.63**	0.48	−0.26
Ln*Dist*	**−0.21**	0.06	−1.15	**−0.16**	0.07	–	−0.07	0.04	2.52	**−0.11**	0.04	3.92	0.35	0.27	2.01
RIMM	**−1.05**	0.48		−0.30	0.75		**0.82**	0.31		***0.62***	0.33		0.94	0.78	
*RIMM**Ln*Dist*	**0.17**	0.07		0.12	0.10		−0.08	0.06		−0.06	0.06		−0.28	0.33	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**1.88**	0.18		**1.66**	0.29		**3.00**	0.24		**2.52**	0.23		**3.94**	1.07	
-2LL	587.30			235.90			1260.90			964.70			127.70		
N	171			69			318			254			31		
Non–intimates															
Intercept	**3.07**	1.21	1.00	**3.04**	0.47	0.25	**2.28**	0.17	2.27	**2.56**	0.22	−2.00	**2.14**	0.38	−0.90
Ln*Dist*	−0.10	0.20	−0.64	**−0.25**	0.08	−0.38	−0.03	0.04	0.17	***−0.09***	0.05	3.31	0.26	0.17	1.60
RIMM	−0.76	1.41		0.51	0.76		−0.07	0.25		−0.17	0.30		−0.59	0.62	
*RIMM**Ln*Dist*	0.07	0.22		0.04	0.10		0.00	0.05		0.04	0.06		−0.50	0.45	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**1.62**	0.54		**1.97**	0.32		**2.71**	0.19		**2.49**	0.21		**3.00**	0.73	
-2LL	73.40			286.40			1509.00			1122.90			147.20		
N	22			80			392			298			38		

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level. The column *SEY-t* shows the t-statistics for comparing the parameter estimates reported in the second East York study. The sample of intimate extended kin is excluded for comparison because the sample size is too small ($n = 7$) in the second East York study.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 9. Model 3 results, with spline: face-to-face contact, single classification

				Kinship				*Not related*				*Intimacy*			
		Overall (n = 1052)		*Immediate kin (n = 193)*		*Extended kin (n = 149)*		*All (n = 710)*		*Friends (n = 552)*		*Intimates (n = 558)*		*Non-intimates (n = 494)*	
	Knots (miles)	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intercept		**3.92**	0.10	**4.31**	0.34	**3.75**	0.40	**3.86**	0.15	**3.66**	0.15	**3.93**	0.14	**3.90**	0.15
Ln*Dist*		**−0.23**	0.03	**−0.23**	0.10	−0.12	0.12	**−0.23**	0.05	**−0.21**	0.05	**−0.15**	0.05	**−0.30**	0.05
*d1**(Ln*Dist-*k_{d1}*)*	5	−0.04	0.10	−0.07	0.22	***−0.43***	0.24	−0.02	0.14	−0.01	0.14	−0.12	0.14	−0.01	0.15
*d2**(Ln*Dist-*k_{d2}*)*	50	−0.32	0.26	−0.21	0.49	0.04	0.47	−0.29	0.37	−0.24	0.37	−0.47	0.33	−0.07	0.40
*d3**(Ln*Dist-*k_{d3}*)*	200	0.35	0.27	0.20	0.53	0.26	0.48	0.29	0.38	0.13	0.38	0.55	0.34	0.10	0.42
RIMM		0.08	0.14	−0.39	0.41	−0.54	0.41	0.22	0.20	0.26	0.20	**0.40**	0.20	−0.14	0.19
*RIMM**Ln*Dist*		−0.04	0.03	0.02	0.06	0.04	0.06	−0.06	0.04	***−0.07***	0.04	***−0.07***	0.04	−0.02	0.04
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**1.92**	0.08	**1.55**	0.10	**0.99**	0.12	**2.20**	0.13	**2.07**	0.13	**1.83**	0.11	**1.87**	0.12
-2LL		3693.00		641.80		432.00		2591.40		1984.60		1936.10		1727.10	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\ (X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 10. Model 3 results, with spline: face-to-face contact, intimates and non-intimates

		Kinship				*Not related*			
	Knots (miles)	*Immediate kin*		*Extended kin*		*All*		*Friends*	
		Estimate	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intimates									
Intercept		**4.39**	0.35	**2.22**	0.73	**3.85**	0.17	**3.88**	0.19
Ln*Dist*		**–0.24**	0.10	**0.47**	0.23	**–0.15**	0.06	**–0.16**	0.06
*d1**(Ln*Dist-*k_{d1})	5	–0.01	0.23	***–1.25***	0.42	–0.10	0.20	–0.04	0.20
*d2**(Ln*Dist-*k_{d2})	50	–0.48	0.53	0.21	0.71	–0.43	0.50	–0.50	0.49
*d3**(Ln*Dist-*k_{d3})	200	0.54	0.58	0.36	0.73	0.44	0.50	0.34	0.49
RIMM		–0.05	0.43	–0.35	0.62	**0.65**	0.27	0.41	0.28
*RIMM*LnDist*		–0.03	0.07	0.02	0.08	**–0.10**	0.05	***–0.09***	0.05
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.50**	0.00
IT var		**1.04**	0.10	**1.09**	0.20	**2.15**	0.17	**1.87**	0.17
-2LL		606.60		206.20		1156.70		890.90	
N		171		69		318		254	
Non-intimates									
Intercept		1.83	1.75	**4.43**	0.44	**3.87**	0.16	**3.43**	0.22
Ln*Dist*		0.26	0.44	**–0.41**	0.13	**–0.30**	0.05	**–0.22**	0.07
*d1**(Ln*Dist-*k_{d1})	5	–0.87	0.73	–0.06	0.27	0.05	0.18	–0.01	0.19
*d2**(Ln*Dist-*k_{d2})	50	1.35	1.20	0.17	0.57	–0.28	0.52	–0.10	0.54
*d3**(Ln*Dist-*k_{d3})	200	–1.46	1.12	–0.09	0.59	0.28	0.55	0.06	0.58
RIMM		–0.26	1.46	***–0.91***	0.50	–0.03	0.22	0.21	0.28
*RIMM**Ln*Dist*		0.01	0.22	0.10	0.07	–0.04	0.05	–0.07	0.06
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.0
IT var		**1.22**	0.45	**0.73**	0.12	**2.15**	0.15	**2.13**	0.18
-2LL		62.70		210.70		1423.90		1081.10	
N		22		80		392		298	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\,(X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Non-intimates. Non-intimate neighbours meet face-to-face the most often (94.6 times a year). Non-intimate extended kin meet 9 times as often (83.9) as their intimate counterparts; non-intimate friends meet 30.9 times a year. The small number of non-intimate immediate kin ($n = 22$) meet only 6.2 times a year. When immediate kin do not fit the norm of intimacy, contact is low and usually takes place only in larger kinship group gatherings (Wellman, 1990).

Face-to-face contact among all non-intimate role relationships is sensitive to distance except for non-intimate immediate kin, who receive insignificant estimates for all distance variables and knots. The frequencies for non-intimate extended kin and neighbours drop smoothly over

Table 11. Model 3 results, without spline: face-to-face contact, single classification

				Kinship					
	Overall (n = 1052)			*Immediate kin (n = 193)*			*Extended kin (n = 149)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**4.03**	0.09	3.09	**4.54**	0.28	0.30	**4.46**	0.24	4.11
Ln*Dist*	**–0.28**	0.02	–2.36	**–0.31**	0.05	0.61	**–0.37**	0.04	–1.51
RIMM	0.08	0.14		0.35	0.40		**–0.81**	0.40	
*RIMM**Ln*Dist*	–0.04	0.03		0.00	0.06		0.08	0.05	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**1.93**	0.08		**1.53**	0.16		**1.01**	0.12	
-2LL	3692.80			640.10			434.00		

	Not related								
	All (n = 710)			*Friends (n = 552)*			*Neighbours (n = 69)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**3.93**	0.11	1.81	**3.77**	0.14	0.43	**4.28**	0.22	–1.26
Ln*Dist*	**–0.27**	0.03	–2.23	**–0.26**	0.03	0.46	–0.16	0.10	–1.95
RIMM	0.23	0.17		0.29	0.20		**0.70**	0.35	
*RIMM**Ln*Dist*	***–0.07***	0.04		**–0.09**	0.04		0.22	0.15	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**2.20**	0.12		**2.08**	0.13		**1.83**	0.32	
-2LL	2588.90			1983.10			310.60		

	Intimacy					
	Intimates (n = 558)			*Non-intimates (n = 494)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**4.15**	0.13	–0.16	**3.93**	0.13	2.83
Ln*Dist*	**–0.27**	0.02	–0.60	**–0.31**	0.03	–2.14
RIMM	**0.46**	0.21		–0.14	0.19	
*RIMM**Ln*Dist*	**–0.08**	0.03		–0.02	0.04	
IR var	**0.00**	0.00		**0.00**	0.00	
IT var	**1.86**	0.11		**1.86**	0.12	
-2LL	1943.50			1721.90		

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level. The column *SEY-t* shows the t-statistics for comparing the parameter estimates reported in the second East York study.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 12. Model 3 results, without spline: face-to-face contact, intimates and non-intimates

	Kinship						*Not related*								
	Immediate kin			*Extended kin*			*All*			*Friends*			*Neighbours*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intimates															
Intercept	**4.59**	0.28	0.23	**4.65**	0.38	–	**4.01**	0.16	−0.52	**4.07**	0.18	0.73	**3.96**	0.36	−3.46
Ln*Dist*	**−0.31**	0.05	−0.48	**−0.36**	0.06	–	**−0.25**	0.04	0.44	**−0.27**	0.04	−0.32	−0.14	0.20	−0.27
RIMM	−0.04	0.42		−0.83	0.66		**0.72**	0.26		***0.51***	0.28		**1.46**	0.58	
*RIMM**Ln*Dist*	−0.03	0.06		0.08	0.09		**−0.13**	0.05		**−0.12**	0.05		0.14	0.25	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**1.48**	0.16		**1.29**	0.23		**2.17**	0.17		**1.91**	0.17		**2.22**	0.61	
-2LL	562.20			219.70			1159.60			895.40			112.30		
N	171			69			318			254			31		
Non-intimates															
Intercept	**3.73**	1.08	−0.36	**4.39**	0.28	3.70	**3.88**	0.15	1.67	**3.48**	0.20	−3.13	**4.55**	0.27	0.36
Ln*Dist*	−0.28	0.18	0.16	**−0.40**	0.05	−2.02	**−0.30**	0.04	−2.30	**−0.24**	0.04	4.49	***−0.21***	0.12	−2.44
RIMM	−1.12	1.26		**−0.92**	0.45		−0.02	0.22		**0.21**	0.28		0.02	0.44	
*RIMM**Ln*Dist*	0.08	0.20		***0.11***	0.06		−0.04	0.05		−0.07	0.06		0.15	0.32	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**1.29**	0.43		**0.71**	0.11		**2.13**	0.15		**2.11**	0.17		**1.52**	0.37	
-2LL	69.20			208.50			1420.30			1078.00			124.10		
N	22			80			392			298			38		

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level. The column *SEY-t* shows the t-statistics for comparing the parameter estimates reported in the second East York study. The sample of intimate extended kin is excluded for comparison because the sample size is too small ($n = 7$) in the second East York study.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

distance, at a rate of -0.3 per cent. All knots are insignificant.

Overall Contact (Model 4)

As people use many media to stay in contact with their active ties, it is important to look at the overall personal communication systems (Tables 13–16). By one medium or another, respondents are in contact with their alters an average of 129.0 times a year, nearly twice per week. Overall, e-mail is used most often (70.1 times a year), followed by face-to-face (50.4 times) and phone (19.3 times), although specific profiles vary by alter, role relationship and tie strength.

There is no cusp point: the mean frequency of contact drops smoothly over residential distance, with all coefficient estimates for the knots being insignificant. The frequency drops by 0.1 per cent for each 1 per cent increase in distance. This result implies that, with increasing distance, phone and then e-mail compensate for less face-to-face contact.

Among the various role relationships, immediate kin contact each other the most frequently (323.8 times a year), followed by neighbours (138.4 times), extended kin (117.9 times) and friends (115.6 times). The strength of ties also matters: intimates communicate more often (157.6 times) than non-intimates (101.5 times).

Among immediate kin and friends, the frequency of overall contact drops smoothly over distance: for each 1 per cent increase in distance, contact drops by 0.2 per cent. Extended kin show a non-linear pattern. Their overall contact is insensitive to distance within 150 miles; beyond 150 miles, frequency of contact increases by 0.4 per cent.

Overall contact with intimates is only moderately sensitive to distance: the ties are strong enough that they find a way to be in touch. Frequency drops modestly at a rate of 0.1 per cent within 150 miles; beyond 150 miles, frequency increases at a rate of 0.1 per cent. For non-intimates, the frequency of overall contact decreases smoothly at a rate of 0.2 per cent.

Intimates. Immediate kin are in contact the most frequently: 327.0 times a year, followed by intimate neighbours (167.3 times), friends (159.2 times) and extended kin (57.4 times)—their frequency is one-sixth as often as immediate kin.

Overall, contacts among intimate immediate kin and friends drop smoothly over distance at a rate of 0.2 per cent and 0.1 per cent respectively. Extended kin show a different pattern: their frequency of contact is insensitive to distance within 5 miles, beyond which their frequency drops by 0.6 per cent.

Non-intimates. Like their intimate counterparts, non-intimate immediate kin are in overall contact the most often among various kinship groups at an average of once every three days (175.9 times a year), followed by extended kin, who contact each other 167.3 times a year. Neighbours are in contact on average 125.2 times a year. Non-intimate friends are in contact only 80.6 times a year.

Contacts among non-intimate kin are not sensitive to distance. Non-intimate friends are sensitive to distance: their frequency of contact drops smoothly over distance at a rate of 0.2 per cent.

Comparing How Distance Has Mattered Before and After the Internet

Has the influence of distance on the frequency of contact changed after the Internet? To address this question, we compare the 2005 data from the third East York study (reported on here) with the pre-e-mail data from the second (1978) East York study (reported in more detail in Mok and Wellman, 2007; Wellman *et al.*, 1988). Our comparison uses multilevel models without spline.

Table 13. Model 4 results, with spline: overall contact, single classification

				Kinship				*Not related*						*Intimacy*			
	Knots (miles)	*Overall (n = 1052)*		*Immediate kin (n = 193)*		*Extended kin (n = 149)*		*All (n = 710)*		*Friends (n = 552)*		*Neighbours (n = 69)*		*Intimates (n = 558)*		*Non-intimates (n = 494)*	
		Estimate	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intercept		**4.86**	0.12	**5.78**	0.39	**4.77**	0.57	**4.75**	0.12	**4.75**	0.16	**4.93**	0.21	**5.06**	0.15	**4.62**	0.16
Ln*Dist*		**−0.15**	0.04	**−0.26**	0.12	−0.10	0.17	**−0.14**	0.04	**−0.16**	0.05	0.10	0.13	**−0.10**	0.05	**−0.18**	0.05
*d1**(Ln*Dist*-k_{d1})	5	−0.12	0.12	−0.01	0.26	−0.42	0.34	−0.12	0.14	−0.06	0.15	−0.09	0.92	−0.15	0.14	−0.18	0.17
*d2**(Ln*Dist*-k_{d2})	50	−0.23	0.35	0.16	0.68	−0.77	0.82	−0.04	0.44	−0.16	0.46	−12.66	8.01	−0.44	0.40	0.22	0.53
*d3**(Ln*Dist*-k_{d3})	150	0.56	0.35	0.10	0.69	***1.61***	0.82	0.31	0.44	0.42	0.46	***16.39***	9.11	***0.81***	0.41	0.04	0.54
RIMM		−0.13	0.16	−0.76	0.47	−0.45	0.57	0.02	0.18	−0.10	0.21	***0.63***	0.33	0.13	0.21	−0.18	0.21
*RIMM**Ln*Dist*		0.03	0.03	***0.12***	0.07	0.00	0.08	−0.01	0.04	0.02	0.04	0.03	0.26	0.05	0.04	−0.03	0.04
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0
IT var		**2.39**	0.10	**2.01**	0.21	**1.94**	0.23	**2.35**	0.13	**2.31**	0.14	**1.67**	0.30	**1.92**	0.12	**2.25**	0.14
-2LL		3919.80		690.20		527.40		2636.80		2042.50		224.60		1963.50		1815.40	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\ (X_{ij} - k_d) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

Table 14. Model 4 results, with spline: overall contact, intimates and non-intimates

		Kinship				*Not related*			
		Immediate kin		*Extended kin*		*All*		*Friends*	
	Knots (miles)	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*	*Estimate*	*S.E.*
Intimates									
Intercept		**5.79**	0.35	**3.94**	0.81	**4.92**	0.17	**5.07**	0.19
Ln*Dist*		**–0.25**	0.10	0.26	0.25	–0.07	0.06	**–0.12**	0.06
*d1**(Ln*Dist-*k_{d1})	5	0.06	0.23	***–0.83***	0.47	–0.22	0.20	–0.09	0.20
*d2**(Ln*Dist-*k_{d2})	50	–0.30	0.63	–0.45	0.93	–0.28	0.60	–0.51	0.59
*d3**(Ln*Dist-*k_{d3})	150	0.61	0.65	1.13	0.93	0.63	0.59	0.70	0.57
RIMM		–0.28	0.43	–0.61	0.69	0.40	0.27	0.04	0.28
*RIMM**Ln*Dist*		0.07	0.07	0.13	0.09	0.00	0.05	0.05	0.05
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**1.50**	0.17	**1.34**	0.24	**2.17**	0.17	**1.88**	0.17
-2LL		563.70		218.60		1159.90		892.00	
N		171		69		318		254	
Non-intimates									
Intercept		5.17	3.22	**5.12**	0.67	**4.59**	0.16	**4.39**	0.24
Ln*Dist*		–0.27	0.82	–0.30	0.20	**–0.18**	0.06	**–0.16**	0.07
*d1**(Ln*Dist-*k_{d1})	5	–0.41	1.36	–0.30	0.43	–0.05	0.19	–0.08	0.21
*d2**(Ln*Dist-*k_{d2})	50	2.79	2.80	–0.51	1.13	0.11	0.62	–0.04	0.66
*d3**(Ln*Dist-*k_{d3})	150	–3.13	2.67	1.34	1.13	0.09	0.63	0.36	0.68
RIMM		–2.27	2.69	–0.70	0.74	–0.11	0.22	–0.07	0.30
*RIMM**Ln*Dist*		0.29	0.41	0.01	0.11	–0.04	0.05	–0.02	0.06
IR var		**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00
IT var		**4.15**	1.52	**1.68**	0.28	**2.21**	0.16	**2.35**	0.19
-2LL		80.60		270.60		1434.90		1109.50	
N		22		80		392		298	

Notes: The model is based on the equation $Y_{ij} = \gamma^1_{00} + \gamma^1_{11} Z_j + \gamma^1_{10} X_{ij} + \gamma^2_{10} d\left(X_{ij} - k_d\right) + \gamma^2_{11} Z_j X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

The 1978 and 2005 samples differ somewhat in terms of the characteristics of the role relationships.[5] First, the present post-Internet study involves relationships with longer mean distances than the pre-Internet second study. The mean distance in the 2005 study is 1.8 times greater than the mean reported in the 1978 study. Yet, the median distance is somewhat lower in the present study (6.4 miles) than in the 1978 study (8.5 miles). This suggests that, while the Internet has helped to maintain contact with extremely distant ties, it has not expanded the spatial range of all active ties.

Secondly, the present study contains an older sample than the second study. Thirdly, the present study contains more transoceanic immigrants and hence a greater likelihood of very distant ties. Fourthly, respondents from the present study have identified a

Table 15. Model 4 results, without spline: overall contact, single classification

				Kinship					
	Overall (n = 1052)			*Immediate kin (n = 193)*			*Extended kin (n = 149)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**4.88**	0.10	3.42	**5.52**	0.32	1.34	**5.20**	0.34	1.60
Ln*Dist*	**–0.18**	0.02	1.07	**–0.19**	0.05	1.42	**–0.30**	0.05	0.36
RIMM	–0.20	0.16		***–0.91***	0.46		–0.79	0.56	
*RIMM**Ln*Dist*	**0.06**	0.03		**0.17**	0.07		0.10	0.08	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**2.40**	0.10		**2.01**	0.21		**2.04**	0.24	
-2LL	3921.70			691.40			536.60		
	Not related								
	All (n = 710)			*Friends (n = 420)*			*Neighbours (n = 69)*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intercept	**4.77**	0.11	3.05	**4.74**	0.14	0.89	**4.92**	0.22	0.05
Ln*Dist*	**–0.16**	0.03	1.38	**–0.17**	0.03	2.81	–0.05	0.10	–0.45
RIMM	–0.01	0.17		–0.14	0.21		***0.65***	0.35	
*RIMM**Ln*Dist*	**0.08**	0.04		0.04	0.04		0.15	0.15	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**2.35**	0.13		**2.31**	0.14		**1.81**	0.32	
-2LL	2634.60			2040.40			240.20		
	Intimacy								
	Intimates (n = 558)						*Non intimates (n = 494)*		
	Estimate	*S.E.*	*SEY-t*				*Estimate*	*S.E.*	*SEY-t*
Intercept	**5.15**	0.13	–0.04				**4.65**	0.15	2.89
Ln*Dist*	**–0.17**	0.03	2.47				**–0.22**	0.03	1.88
RIMM	0.06	0.21					–0.22	0.21	
*RIMM**Ln*Dist*	**0.08**	0.03					–0.01	0.04	
IR var	**0.00**	0.00					**0.00**	0.00	
IT var	**1.94**	0.12					**2.24**	0.14	
-2LL	1967.00						1812.80		

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level. The column *SEY-t* shows the t-statistics for comparing the parameter estimates reported in the second East York study.
Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

significantly greater percentage of intimates among their active ties: 53.0 per cent as compared with only 39.1 per cent in the second study. Fifthly, the present study includes more friends, but fewer neighbours and immediate kin.

Our comparison is made, based on the results reported in Tables 7, 8, 11, 12, 15 and

Table 16. Model 4 results, without spline: overall contact, intimates and non-intimates

	Kinship						*Not related*								
	Immediate kin			*Extended kin*			*All*			*Friends*			*Neighbours*		
	Estimate	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*	*Estimate*	*S.E.*	*SEY-t*
Intimates															
Intercept	**5.56**	0.28	0.83	**5.41**	0.40	–	**5.02**	0.16	–0.30	**5.18**	0.18	1.08	**5.12**	0.30	–1.47
Ln*Dist*	**–0.18**	0.05	0.93	**–0.26**	0.06	–	**–0.16**	0.04	3.87	**–0.19**	0.04	1.91	0.18	0.17	2.00
RIMM	–0.49	0.42		–0.97	0.69		0.39	0.26		0.04	0.28		**1.13**	0.49	
*RIMM**Ln*Dist*	**0.14**	0.06		**0.20**	0.09		0.01	0.05		0.05	0.05		–0.18	0.21	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**1.52**	0.17		**1.42**	0.25		**2.18**	0.17		**1.88**	0.17		**1.55**	0.42	
-2LL	566.10			226.10			1161.40			892.00			102.60		
N	171			69			318			254			31		
Non-intimates															
Intercept	**5.03**	1.85	0.35	**5.24**	0.44	2.48	**4.55**	0.15	2.05	**4.33**	0.21	–0.92	**4.83**	0.29	0.28
Ln*Dist*	–0.25	0.31	–0.13	**–0.39**	0.07	–1.49	**–0.16**	0.04	0.69	**–0.15**	0.05	3.58	–0.14	0.13	–1.52
RIMM	–2.07	2.15		–1.04	0.71		–0.13	0.22		–0.10	0.29		0.09	0.48	
*RIMM**Ln*Dist*	0.21	0.34		0.13	0.10		–0.03	0.05		***–0.10***	0.06		0.06	0.34	
IR var	**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00		**0.00**	0.00	
IT var	**3.79**	1.26		**1.73**	0.28		**2.20**	0.16		**2.34**	0.19		**1.77**	0.43	
-2LL	88.60			276.60			1432.90			1109.00			1292.00		
N	22			80			392			298			38		

Notes: The model is based on the equation $Y_{ij} = \gamma_{00} + \gamma_{01}Z_j + \gamma_{10}X_{ij} + u_i + \varepsilon_{ij}$. (For definition of terms, see notes to Table 1.) *IR var* shows the amount of variation at the respondent level, whereas *IT var* is the amount of variation at the community tie level. The total variation is the sum of *IR var* and *IT var*. Estimates shown in bold are significant at the 5 per cent level; those that are also italicised are significant at the 10 per cent level. The column *SEY-t* shows the t-statistics for comparing the parameter estimates reported in the second East York study. The sample of intimate extended kin is excluded for comparison because the sample size is too small ($n = 7$) in the second East York study.

Source: Connected Lives (third East York study) interview data, 2005; calculations by the authors.

16. In these tables, the column '*SEY-t*' shows the t-statistics associated with testing the difference in parameter estimates between the 1978 and the 2005 East York studies.

Overall, the frequency of phone contact has increased from 1978 to 2005: from 12.3 to 19.3 times a year. The higher mean in 2005 is driven primarily by the higher frequency among intimate immediate kin: they phoned 120.3 times a year, compared with 9.8 times in 1978. Non-intimate friends are the only ones who phoned less often in 2005: they phoned 11.6 times a year, compared with 26 times in 1978. Meanwhile, friends—especially intimate friends—have become less sensitive to distance. The slope parameter reduces by half from 0.3 per cent in 1978 to 0.1 per cent in 2005. This increased frequency probably reflects the much lower costs of long-distance telephony in 2005.

The frequency of face-to-face contact has increased and its sensitivity to distance has also increased between the 1970s and the 2000s. Overall, the mean frequency of face-to-face contact was 44.8 times a year in 1978 and 56.3 times in 2005: a significant increase. The only exception is intimate neighbours, who met less often in 2005 (52.5 times a year), compared with 162.9 times in 1978. Moreover, the frequency of face-to-face contact dropped slightly faster over distance in 2005 post-Internet, dropping at a rate of -0.24 per cent as opposed to -0.21 per cent in 1978. Face-to-face contact among non-intimate extended kin has become particularly more sensitive to distance (-0.4 per cent in 2005 versus -0.3 per cent in 1978).

The implication of these results is that, despite the advancement in telecommunication technologies, face-to-face contact has increased substantially. Its sensitivity to distance has increased post-Internet. This result supports the assertion that phones and e-mails might have played a complementary role in facilitating face-to-face contacts.

Has Distance Died?

Summary

Despite persistent fears about the death of community in both the developed and less developed worlds, the East Yorkers we studied have abundant contact with their active ties, an average of 129.0 times per year (about twice per week). As people have a median of 23 active ties, this means they use a variety of media to have 2967 contacts per year—about 8 per day—and this is just with the active ties that typically comprise only 10 per cent of their networks.

Our results also show that people related by kin—immediate kin or extended kin—are usually in contact with one another more often than those who are not related. The only exception is face-to-face contact. Friends and neighbours see each other more than extended kin. In terms of tie strength, intimates contact their community ties more often than non-intimates, either by meeting, phoning or e-mailing each other.

E-mail has joined face-to-face and phone as a major medium of communication. Once distance has been accounted for, people e-mail more frequently than they phone or meet each other. Indeed, people e-mail each other most often (70.1 times), followed by face-to-face contact (50.4 times) and phone contact (19.3 times). Moreover, the mean score hides the fact that those who do use e-mail, use it a lot.

Distance is dead only if e-mail is looked at in isolation. E-mail contact is insensitive to distance. It is as frequent at 500 miles as at 5 and 50 miles. When relationships are very distant—transoceanic—e-mail is almost the only medium the East Yorkers use for contact, as Internet phone services such as Skype had not become widely known.

Although e-mail gets the lion's share of hype and analysis these days, it is the relationship that is most important—and not the medium of communication. Most active

ties communicate by multiple means. The exceptions are the obvious extremes: neighbours and alters living 3000 miles apart.

Despite the distance insensitivity of the Internet, distance still matters for the overall relationship. Yet, different modes of communication have different sensitivities to distance

—*The frequency of e-mail* shows a cusp point at 3000 miles: within 3000 miles, distance decreases by 0.1 per cent for each 1 per cent increase in distance; beyond 3000 miles, the frequency of contact increases at 5.8 per cent.
—*Phone contact* is half as sensitive to distance as face-to-face contact. Its sensitivity to distance drops modestly beyond 100 miles, but increases beyond 500 miles.
—Face-*to-face contact* displays a marked drop at 5 miles. Beyond 5 miles, the frequency of face-to-face contact drops nearly twice as fast as those relationships that live within 5 miles. Not surprisingly, immediate kin and neighbours meet each other face-to-face the most often.

Distance has little impact on how often people phone each other within 100 miles. As this is an appreciably further distance than that covered by Toronto's flat-rate telephone plans, the 100-mile cusp point is not heavily driven by costs. However, 100 miles is at the outer limit of a day's drive from East York, suggesting that face-to-face and phone contact are intertwined. Despite the prevalence of low-cost telephone plans for longer distances, the frequency of phone contact drops twice as fast for relationships that are more than 100 miles apart.

Tie strength and traditional kinship ties remain important predictors of who contacts whom. Intimates contact each other more often than non-intimate active ties, regardless of the mode of contact. For both intimates and non-intimates, immediate kin contact each other more frequently than extended kin or friends.

Technology has only partially altered the way people maintain their relationships in this Canadian city. The frequency of face-to-face and phone contact among various role relationships has hardly changed between the 1970s and the 2000s. Such contact is also similarly sensitive to distance, pre- and post-Internet, with the exceptions of intimate neighbours and non-intimate friends. Face-to-face and phone contacts among non-intimate friends have become less sensitive to distance.

The frequency of overall contact is higher in 2005 than 1978, attributable to the addition of e-mail to the ensemble of communication media. The mean frequency of overall contact of once every three days in 2005 is up a bit from once every four days in 1978. However, the frequency of overall contact remained similarly sensitive to distance in 2005, reflecting the zero distance-related cost of e-mail, lower costs for short- and long-distance telephony, and lower airplane travel costs.

As the frequency of face-to-face contact has only modestly changed between the two studies, phone and e-mail account for the lion's share of lower sensitivity to distance. Almost all of the intercept parameters in 2005 receive an estimate that is not significantly different from those in 1978. The exceptions are face-to-face contact among intimate neighbours. Among intimate neighbours, the frequency of face-to-face contact in 2005 is one-third as often as in 1978. This result reflects e-mail's advantage in maintaining contact with weaker ties (Boase *et al.*, 2006).

Telephoning is coupled with face-to-face contact in 2005, just as it was in 1978. The frequency of face-to-face and phone contact is positively related: those who are seen the most phone the most, and contact by both phone and face-to-face declines by distance.

However, there does appear to be some shift from phone to e-mail. Phone contact among intimate and non-intimate friends is less than

one-third as sensitive to distance in 2005 as compared with 1978.

Implications

Our study has multiple implications for understanding communication technology and social networks. As with any case study, our specific findings pertain only to the East York locality. Yet, we believe that their implications are pertinent to North America, the developed world and, perhaps, the less developed world (for a similar rural Canadian analysis, see Collins and Wellman, 2010).

First, these results suggest some 'specialisation' of various modes of contact with respect to distance. Face-to-face contact is predominantly local, which involves mainly short-distance relationships. Despite the widespread availability of cars, transit and planes, its frequency drops rapidly beyond 5 miles. By contrast, phone contact is regional. It allows people to reach alters who live further away: its frequency drops slowly within 100 miles but drops faster beyond 100 miles. E-mail is by far the fastest and easiest way to reach people across provinces and nations.

Secondly, this is fuzzy specialisation, with almost everyone using multiple media, but in different proportions, depending on their distance apart and the nature of their relationship. All but neighbours phone or e-mail; all but transoceanic ties have appreciable face-to-face and phone contact. In between, people use whatever means is necessary and deemed appropriate to communicate. Although people have become more comfortable with e-mail since its mostly instrumental use a decade ago, it is hard to hug online. Yet, our interviews tell us that some people prefer e-mailing friends and relatives because of its ease and quickness of use: not everyone wants a nuanced, hugging relationship in every interaction (Wellman *et al.*, 2006).

Thirdly, distance still matters for personal networks in the Internet era. The frequencies of both face-to-face and phone contact drop significantly over distance. What is more striking is that the degree of sensitivity is similar pre- and post-Internet, despite the putative ability of the Internet to facilitate face-to-face and phone contact. This result contributes to the on-going debate regarding the death of geography in the advent of telecommunication technologies—our results support the anti-thesis that geography still matters.

Fourthly, compared with 1978, the Internet has enabled the East Yorkers to have more contact with more ties (Wellman *et al.*, 2006). Face-to-face and phone contact remain high, with Internet contact (e-mail, etc.) added. This is consistent with American and world survey data (Quan-Haase and Wellman, 2002; Chen *et al.*, 2002; Boase *et al.*, 2006).

Fifthly, distance has become effectively shorter in the transitions from carriages to railroads to expressways to airplanes. With e-mail and phone contact, time may be simultaneous, although communicators still must deal with time-zone work/sleep cycles. With glocalisation, people exist in multiple times, local and distant (Zeruvabel, 1985; Hongladarom, 2002; Galison, 2003). For example, one of us will e-mail the Editors of this journal, trusting that they will get our file tomorrow across the Atlantic; then, one will phone the other 100 km apart—"it's done"; finally, we will hug our spouses and turn out the lights in 'real time'.

Sixthly, the proliferation of e-mail (and IM) and mobile phone use is part of the great transitions away from door-to-door contact (walking) and place-to-place contact (by phone, transit or driving). While neighbours still walk door-to-door and many households drive/fly to have place-to-place contact, our interviews make it clear that much communication is *person-to-person* (Wellman, 2001). At each end of the communication link, people log in to their Internet accounts as individuals, not as households. Not only is the relationship relatively insensitive to distance, it can be independent of any other household

member. Although still somewhat sensitive to distance, mobile phone ties also share the characteristic of person-to-person contact in comparison with traditional landline phones. While our data are from Toronto, we suspect this transition is happening globally, albeit unevenly (Fortunati *et al.*, 2003).

Seventhly, the result is a personalised and somewhat mobile society, even though we have to e-mail from somewhere. Our 'place' is wherever our computer and phone are (Casey, 1997; Urry, 2007). Yet, the continued prevalence of kinship and neighbourhood ties suggests that traditional solidarities remain strong. E-mail especially enables kinship ties to be active over great distances, as the social cohesion of relatives partially surmounts distance. There is a solid core of some (but not all) kin, combined with a multitude of sparsely knit friends. Yet, at the same time, friendship remains abundant and strong, using whatever communication means needed, and the time and availability deemed most necessary for the contact.

Eighthly, the combination of face-to-face, phone and e-mail communication means that the role of cities as interaction maximisers remains, in modified form. Cities continue to foster face-to-face contact and much contact is local. There is no global village. Rather, there is glocalisation, with extensive local contact joined by amplified long-distance connectivity. The city is no longer the boundary—if it ever was: it is the hub.

Notes

1. 'Heavy users' are respondents who use the Internet at least 7 hours a week; 'moderate users' use it less than 7 hours a week, while 'non-users' do not use the Internet at all (see the expanded online version of the paper for the table of sample characteristics by Internet use: www.chass.utoronto.ca/~wellman/publications/index.html).
2. Immigrants refer to respondents who were born outside Canada, regardless of the year of arrival. We re-estimated the models by identifying 'recent immigrants' who have stayed in Canada for less than 10 years ($n = 194$) or 5 years ($n = 156$). The result is comparable with what is reported in the present study.
3. See expanded online version of this paper.
4. As only three neighbours live further than 5 miles away from their egos, all discussions of neighbours are based on the multilevel model without spline specification.
5. See expanded online version of this paper.

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