

# Lurker demographics: Counting the silent

**Blair Nonnecke**

Dept. of Information Systems  
1000 Hilltop Circle  
Baltimore, MD 21250 USA  
+1 410 455 3795  
nonnecke@umbc.edu

**Jenny Preece**

Dept. of Information Systems  
1000 Hilltop Circle  
Baltimore, MD 21250 USA  
+1 410 455 6238  
preece@umbc.edu

## ABSTRACT

As online groups grow in number and type, understanding lurking is becoming increasingly important. Recent reports indicate that lurkers make up over 90% of online groups, yet little is known about them.

This paper presents a demographic study of lurking in email-based discussion lists (DLs) with an emphasis on health and software-support DLs. Four primary questions are examined. One, how prevalent is lurking, and do health and software-support DLs differ? Two, how do lurking levels vary as the definition is broadened from zero posts in 12 weeks to 3 or fewer posts in 12 weeks? Three, is there a relationship between lurking and the size of the DL, and four, is there a relationship between lurking and traffic level?

When lurking is defined as no posts, the mean lurking level for all DLs is lower than the reported 90%. Health-support DLs have on average significantly fewer lurkers (46%) than software-support DLs (82%). Lurking varies widely ranging from 0 to 99%. The relationships between lurking, group size and traffic are also examined.

## Keywords

Lurker, lurking, discussion list, demographic, newsgroup, BBS, email, health-support, traffic, membership

## INTRODUCTION

DLs, newsgroups, and Web-based bulletin board systems (BBSs) have experienced rapid growth as the number of Internet users climbs. As of July 1999, there are more than 131,000 DLs using Listserv's<sup>®</sup> server software. The 69,000,000 members of these DLs receive in excess of 29,000,000 messages per day [6]. Whittaker et al [19] also cite large numbers for Usenet newsgroups. The growth and prevalence of online groups, coupled with the relative ease of gathering persistent and traceable messages, has made online groups a fertile ground for research. The following are a few of the areas so far studied: the development of friendship [12], the perception and quality of community

*Permission to make digital/hard copy of all or part of this material is granted provided that copies are not made or distributed for profit or commercial advantage, the ACM copyright/server notice, the title of the publication and its date appear, and notice is given that copying is by permission of the Association of Computing Machinery, Inc. (ACM). To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or fee.*

CHI 2000 The Hague Netherlands Copyright ACM 2000

[15], factors affecting interaction within newsgroups [19], and the development of empathy in health-support groups [13, 14]. Each of these studies was based on examining individuals participating in public spaces, i.e., those who post. None examined their chosen area from a lurking perspective, even though lurkers are reported to make up over 90% of several online groups [2, 7].

Given that lurkers are both unstudied and apparently in the majority, knowing more about them will have benefits in many areas. Their sheer number suggests they are important to study. From a usability perspective, improvements in tools and group design will fall out of a better understanding of lurkers and their activities. For lurkers and their communities, self-knowledge of lurking will demystify lurkers' roles, value, and activities. This has already been shown to be the case when a participant in an initial study responded to a draft article on lurking [11]:

Maybe it's a sign of my own mild discomfort around being a lurker, but I found it reassuring to recognize myself and my behaviour within the continuum you describe, and to see lurking treated seriously, with both acceptance and respect. As a lurker, I'm used to observing from the sidelines and participating vicariously, and it's strangely gratifying to read an article that speaks directly to that experience. It's almost like suddenly feeling part of an (until-now) invisible community of lurkers.

In their pioneering work, Kollock and Smith [3] describe lurkers as free-riders, i.e., noncontributing, resource-taking members. Knowing more about lurkers and their lurking will show whether this is a fitting description.

As group and community development becomes an important component of commerce on the Internet, understanding lurkers will become an essential part of doing business. Every lurker is a potential customer. For example, Amazon.com has been very successful in creating an online retail environment in which lurkers can make purchasing decisions based on how others have purchased in the past and on reviews supplied by other customers. Amazon.com has leveraged the information gained from those willing to post reviews into purchasing-support tools for the lurker and poster alike.

**Definition**

The online Jargon Dictionary [1] defines lurker as:

One of the 'silent majority' in a electronic forum; one who posts occasionally or not at all but is known to read the group's postings regularly. This term is not pejorative and indeed is casually used reflexively: "Oh, I'm just lurking." When a lurker speaks up for the first time, this is called 'delurking'.

This definition suggests that lurking is the normal behaviour of the majority of the population and that lurking can be defined in terms of the level of participation, either as no posting at all or as some minimal level of posting. However, defining lurking is problematic. Should someone who never posts in public spaces, but regularly side-posts to individual group members, be deemed a lurker? If a person posts once and then never again, are they lurking? Is someone lurking when they go on holidays? Is someone lurking when for a period of time they do not post? While these are important considerations, this study takes the simple approach of defining lurking as either no posts or some minimal number of posts over a period of time.

**Research questions**

The work reported here is the second in a series of studies on lurking [10]. In the first study [11], Internet users were chosen for their membership in online groups, and not for their posting frequency. Given that lurking has been reported as a common means of participation [2, 7], it was assumed that lurkers and their behaviors would be readily encountered within the general Internet population. In the first study, it was found that each participant lurked in at least one online group, and several lurked in all of their online groups. This finding, among others, reinforced the need to better understand lurking. A demographic survey of online discussion groups would provide a different perspective from the first study by emphasizing quantitative measures.

DLs, rather than BBSs or newsgroups, were chosen as the basis of this study for a number of reasons. For the results to have their greatest value, the chosen communication technology needed to be widely used. L-Soft's usage figures show very high levels of use, and of the online discussion groups mentioned by participants in the first study, 25 of the 41 were DLs accessed through email. Just as importantly, DL servers track membership through their subscription mechanism. In turn, DL membership information can be accessed by querying a DL's server. The level of lurking can be measured by tracking posted messages and identifying posters. In contrast, membership levels are unavailable for most BBSs and newsgroups.

This study is an extension of work on online health-support communities [13, 14]. As well, in a study of who pays for

content and interactive media, McMillan [8] provides several reasons for studying health-related groups:

...health and health related subjects have in the past played a central role in the early financial support in many media; health related sites are the fastest growing topic areas in CMC; health-related sites are heavily used; and this area contains one of the fastest growing categories of consumer advertising.

For these reasons, health-support DLs are the focus of this investigation. For comparison purposes, software-support DLs are also included in this study.

The remainder of this paper examines four main questions:

- Q1. How prevalent is lurking, and do health and software-support DLs differ?
- Q2. If lurking is defined as no posting, what happens to lurking levels when the definition is broadened to include minimal levels of posting, e.g., 1 post/month?
- Q3. Is there a relationship between lurking and the number of members in the DL?
- Q4. Is there a relationship between lurking and the traffic level of the DL?

**METHOD**

The primary aim of this work is to understand how much lurking occurs in DLs, with specific emphasis on health and software-support groups.

**Selection of DLs**

To select DLs for the study, L-Soft's CataList catalog and DL search facility [4] were used to locate suitable DLs. A search on the word "support" resulted in a listing of 300 DLs and a description of each. From this listing, subscriptions were taken out on all public DLs relating to health or software-support. To increase sample size, additional subscriptions were taken out on a random selection of health (22) and software (10) support DLs. Although the additional DLs provide support for their members, neither their title nor their one-line catalog description contained the term "support". (Note: Analysis comparing these additional support DLs shows their lurking levels are not significantly different from those found through searching on "support", and as a result, they are included in this study.)

In addition to DLs related to health and software, a random set of DLs on other topics were selected for their large size (CataList displays a description of all DLs with membership greater than 1000 [5]). Eleven randomly selected DLs between 1000 and 2000 members were included as a basis for examining whether large DLs have a greater proportion of lurkers than smaller ones (see Q3. above).

DL set	1. Lurking (% of membership)			2. No. of members			3. Traffic (posts/day)		
	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
<b>All</b> N=109*	55.5	29.6	2.8	551	678.3	65.0	16.2	18.4	1.8
<b>Health</b> N=77*	45.5	28.7	3.3	398.4	439.9	50.1	18.4	18.4	2.1
<b>Software</b> N=21*	82.0	13.9	3.0	662.4	1091.2	238.1	3.1	4.7	1.0

\* No. of DLs in set, SD=Standard Deviation, SE=Standard Error of Mean

Table 1: Lurking, no. of members and traffic for the DL sets

### Data collection

Messages were collected from the selected DLs over a three-month period at a rate of slightly less than 2000 messages/day. Eudora Pro was used to collect and filter email into separate mailboxes for each list, and to monitor the process on a regular basis. Using CataList, the membership size of each list was determined at the beginning and end of the collection period. Lurking levels reported in this study are based on the lower of the two membership levels recorded for the 12-week period.

At the end of 12 weeks, the DLs were examined to ensure that each DL had sent at least one post a month for the 12 weeks. Of the 135 original subscriptions, 109 DLs are included in the study. DLs were dropped from the study if they stopped sending messages for any reason, e.g., change of server, failure on the part of the researchers to reply to subscription notices, or a non-active DL. Messages from the remaining DLs were then run through a Perl script producing records containing the following fields: list name, date, time, size of message, subject heading, and sender. 147,946 messages were transcribed into records and imported into an SQL database. This provided an effective and flexible means for querying and analyzing the data. The data collected represents over 60,000 members and 19,000 posters.

## RESULTS

### Lurking levels

Q1. How prevalent is lurking, and do health and software-support DLs differ?

Using information from the SQL database, mean lurking levels were calculated for the set of all DLs, and for each of the health and software DL sets (see Table 1, column 1). Lurking was defined as no posts within the 12-week collection period. The mean lurking level for all DLs is less than the 90% figures reported by Katz and Mason [2, 7]. It should be noted that while the mean was less than 90%, 12% of the DLs had lurking levels higher than 90%.

The differences in mean lurking levels between the health and software-support DLs is significant. Software-support groups had almost double the number of lurkers. Figure 1 shows the distribution of the lurking levels for each DL type using a box and whisker display. (Note: See Sternstein [16, p. 37] for further information on this visual

representation.) Each horizontal line represents a boundary for 25% of the DLs in the sample. The thicker line is also the median for each type. Each of the central boxes contains 50% of the DLs.

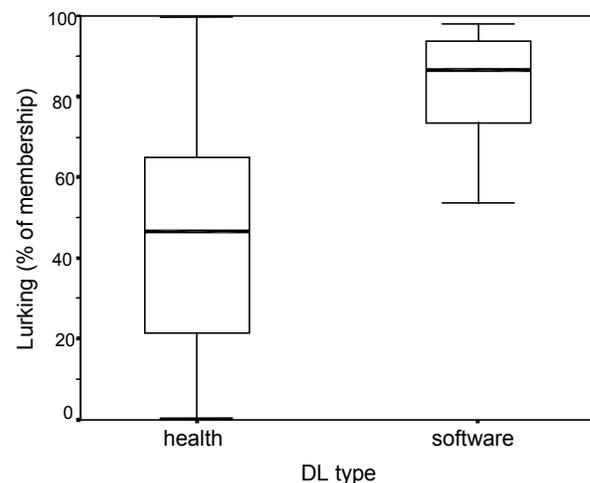


Figure 1: Distribution of lurking levels by quartile for each DL set

Software-support DLs show less variation and none have a lurking level of less than 50%. By contrast, the lurking level of health-support DLs range from zero to 99%. Health-support is a broad umbrella under which to investigate group behaviour. As such, lurking levels may vary according to a number of other factors, e.g., list topic, illness vs. injury, or chronic vs. short term disorders. This difference in variation between the two DL types may be the result of the greater number of health-support DLs in the study, which represents a broader cross-section of their type.

Apart from the low mean number of lurkers in the health-support DLs, what appears most striking about these results is the large variation in lurking levels, and that on average the lurking level for all DLs is lower than the reported 90% figure [2, 7].

### Broadening the definition of lurking

Q2. If lurking is defined as no posting, what happens to lurking levels when the definition is broadened to include minimal levels of posting, e.g., 1 post/month?

In Table 1 lurking was defined as no posts during the 12-week collection period. If lurking is examined on a sliding scale where the allowable posting level can grow, a somewhat different picture emerges. In Figure 2, lurking levels were calculated for a range of cumulative posts, from no posts to 3 or fewer posts for the 12-week period (i.e., 1 or fewer posts per month). As the definition broadens to include more posts in the 12-week period (towards the 3 level), lurking levels move higher. At the level of 3 or fewer posts per 12-week period, the mean lurking level for the health DLs is still lower than 90%, while the software DLs' mean has moved above this level. Both the health and software-support DLs behave in a similar manner, and their relative offset is maintained.

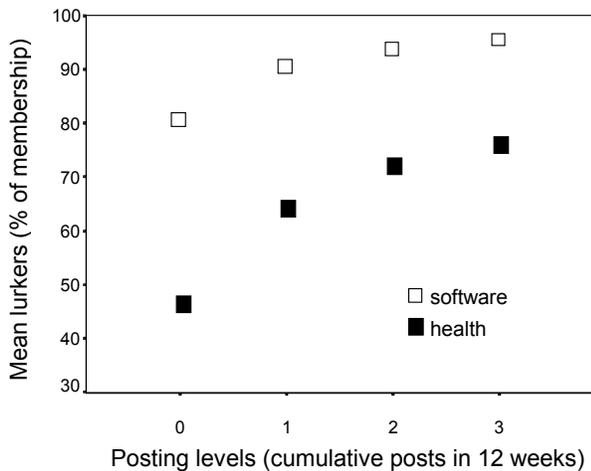


Figure 2: Variation of lurking levels for a range of cumulative posts.

A posting rate of 3 posts in 12 weeks is still an infrequent level of posting. It could be argued that most of what is being done by members at this level is not posting. Presence or visibility of members within a list may be a better indicator of lurking, i.e., is a member known to the other group members in a way that makes them somehow recognizable and thus not lurkers. Defining lurking as a function of the visibility of the poster suggests that other factors would influence this visibility, e.g., the number of members, the number of posters, the activity of the list, and the value and/or notoriety of each participant. It is possible that someone who flames on an irregular basis may be seen as less of a lurker than someone who contributes in a regular but less visible manner. The polar opposite of lurking may be stardom.

Further work is needed in understanding lurking. For example, lurking may not be a continuous state and could be punctuated by periods of public posting based on topic

or need. Using the current data set, there is no reason why analyses of this type cannot be carried out in the future. The raw data could also be used from a contextual or ethnographic perspective, one in which content and dialogue analyses could be carried out. Examples of these kinds of analyses can be found in Preece and Ghozati [14], and Worth and Patrick [20].

### Lurking and the number of members

Q3. Is there a relationship between lurking and the number of members in the DL?

In large DLs lurking may be easier. As the number of members increases, the need for any given member to participate may decline. In addition, high posting levels could create chaos and lurking in large DLs may be a practical means of reducing the number of posts and maintaining order. If either of these is the case, then large DLs should have a greater proportion of lurkers than smaller ones. As can be seen in Table 1 (column 2) health-support DLs have on average fewer members than the software-support DLs. If increasing membership size has the effect of generating more lurkers, then the difference in mean membership levels could explain why health-support DLs have lower levels of lurking.

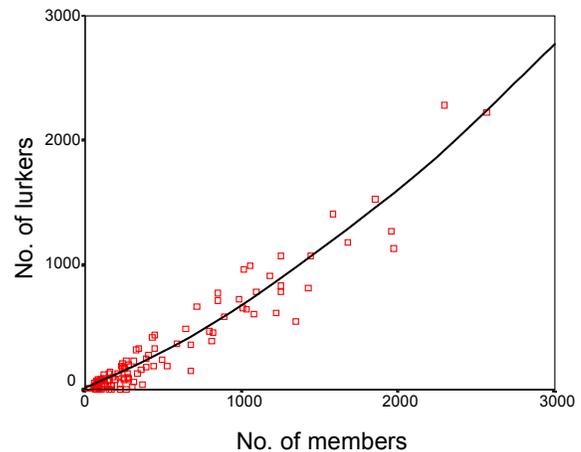


Figure 3: No. of lurkers vs. no. of members for each DL

On examining all 109 DLs in the sample, the anticipated greater incidence of lurking in larger DLs is not strongly shown. Figure 3 shows a strong positive non-linear relationship between the number of lurkers and the size of the DL. A linear regression also fits this data equally well. If this result is taken at face value, membership size does not explain the differences in lurking between the health and software DLs.

The relatively few DLs with over 500 members skews the relationship in favour of the larger DLs. Of the 98 health and software DLs, 74 of them have fewer than 500 members. Figure 4 is a scatter plot of these smaller DLs. The regression line in Figure 4 is a strong positive relationship with a slope less than that in Figure 3. This

suggests that for DLs with fewer than 500 members, there are on average fewer lurkers than in the larger DLs. It should also be noted that that the software-support DLs in Figure 4 are distributed in a straight line. This suggests that even when software-support DLs are of equivalent membership size, they will on average have higher lurker levels.

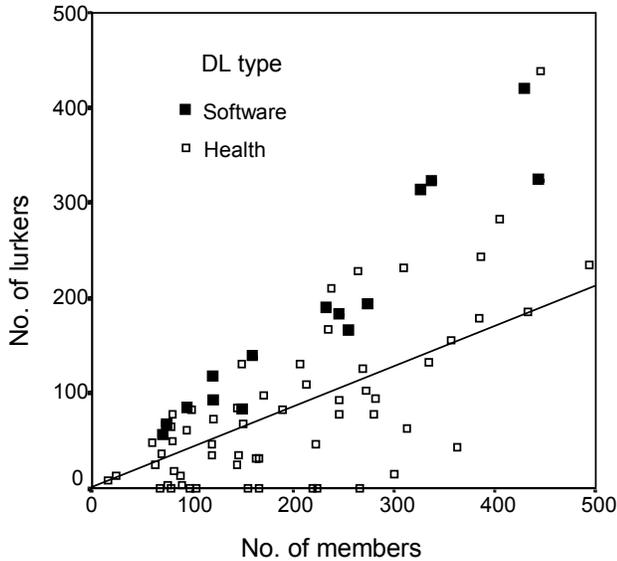


Figure 4: No. of lurkers vs. no. of members for each DL with less than 500 members

DL members receive no direct information about the number of members in a DL. The cues that do exist are indirect, e.g., a query to the server for information, the number of different members posting, the variety of topics covered, and the traffic on the DL. It is possible that a DL of several thousand members could behave like and be indistinguishable from one with only 100 members. More work is required to understand how the size of DLs is perceived by members, and how members respond to this in their various forms of participation.

**Lurking and DL traffic levels**

Q4. Is there a relationship between lurking and the traffic level of the DL?

From the perspective of personal email management, once message rates get above a comfortable level, participating in a DL may take more effort, i.e., there are more messages to read, skim, reply to, etc. Based on participant input from the first study [9], traffic levels were divided into four categories requiring varying levels of management effort (see Table 2).

Management effort	Traffic level	
	messages/week	messages/day
None	< 1	< 0.14
Low	1-3	0.14-0.5
Medium	4-42	0.5-6.0
High	> 42	>6.0

Table 2: Traffic levels for a DL and the corresponding management efforts

The categorization was done prior to examining the distribution of posting rates from the current study. Several participants in the first study indicated that lists with less than 4 or 5 posts per day were easy to handle. In the current study, more than 50% of the DLs fall in the High category. It should also be noted that what is manageable will vary widely between individuals, and will depend on many factors, including type of email software, experience, demands on time, and interest.

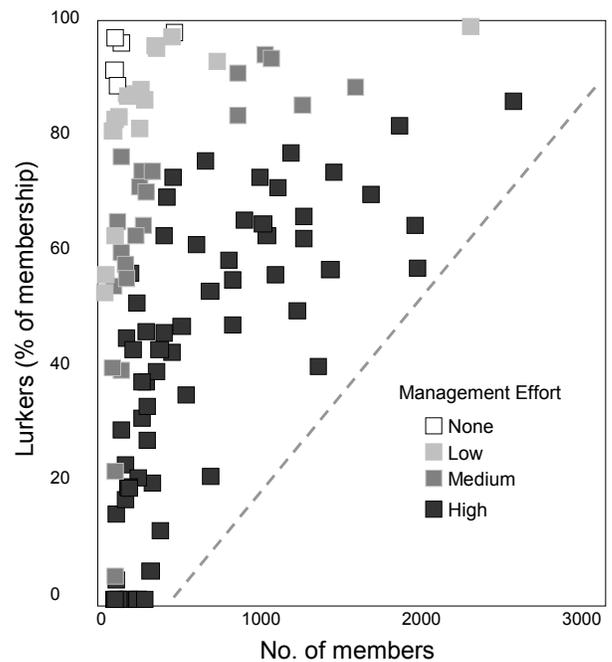


Figure 5: Lurker levels as related to management effort and number of members for each DL

Lurking levels for all DLs were negatively correlated with traffic (Pearson’s correlation coefficient of  $-.426$  is significant at the  $.01$  level). Figure 5 shows that for a given DL size, lists with highest traffic levels generally have the lowest lurking levels. Banding by traffic level is visible, starting with the lowest traffic level (None) in the top left hand corner and progressing towards the lower lurking levels and larger DL size. This partially explains the lower levels of lurking in health-support DLs as these had the higher traffic levels (see Table 1, column 3).

Conspicuously absent are DLs in the area below the broken line, which appears to be a kind of interactive no-man's land. Why this should be the case is not known at the present time, but it could be related to the difficulty of making sense out of large DLs with high traffic volumes and large membership levels. At some point, the DL may become unusable and self-adjust through membership attrition and/or a decrease in public posting. It may be that lurking increases under conditions where having a public voice is difficult. In our initial study [11], several participants indicated they knew other people would post opinions similar to their own in active lists, and thus felt no need to post. When traffic is high, there is a sense that adding messages to the list only increases the traffic without improving the quality. For them, lurking was a way of reducing the noise on the list, a civic duty so to speak. It would be interesting to examine DLs that fall near or below the broken line, and determine whether they transform in any way, e.g., split, have high membership turnover, etc.

Below the 500-member level, health-support DLs appear evenly distributed with respect to number lurkers and thus lurking levels (see Figure 4). For these smaller, more personal-sized groups, the size of the DL may be less of an indicator of lurking level and some other factors may be at work. For DLs with fewer than 500 members, traffic levels appear to be a good predictor of lurking levels (see Figure 5). What drives the combination of low lurking levels and high traffic is still unclear, but may be related to the topic of the DL, motivation of members, and style of interaction (e.g., empathy vs. information exchange).

The DLs with high traffic levels are an interesting group (see Figure 6). The 11 DLs with average traffic levels over 40 messages/day had a low average lurking level of 44%. Four of the DLs were from the Large set of DLs and 7 were health-support. The median membership size for this group was high, at 1220. However, three of these high traffic DLs had fewer than 500 members. For the DLs in this high traffic range, lurking levels appear to be randomly distributed across membership size. As a result, high traffic levels don't appear to be a very good indicator of group size. It is possible that group size becomes immaterial to public participation when it isn't readily knowable.

## DISCUSSION

Much of the discussion related to the four original questions can be found in the previous section. Therefore, this next section focuses on three important issues: lurkers as free-riders, traffic levels, and lurking elsewhere, i.e., how lurking in DLs may differ from either BBSs or newsgroups.

### Lurkers as free-riders

In the Introduction it was mentioned that Kollock and Smith [3] describe lurkers as free-riders. Describing lurkers as free-riders classifies them for their lack of public participation and their use of resources without giving back to the group. Even when lurking is narrowly defined, e.g.,

less than one post/month, the vast majority of DL members are lurkers. This being the case, how do online groups survive in the face of almost universal free-riding?

One explanation is that lurking is not free-riding, but a form of participation that is both acceptable and beneficial to online groups. Public posting is but one way in which an online group can benefit from its members. Members of a group are part of a large social milieu, and value derived from belonging to a group may have far-reaching consequences, e.g., virus alerts being distributed beyond the posters of a DL specializing in combating viruses. A second explanation is that a resource-constrained model may not apply to online groups where the centralized cost of servicing 100 members isn't much different from that of servicing 1000, or even 10,000. In large DLs the danger could be in not having enough lurkers.

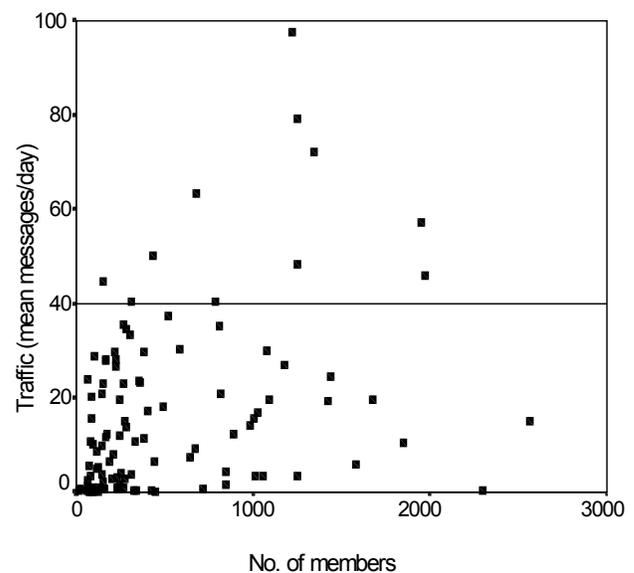


Figure 6: Traffic levels vs. no. of members

### Traffic levels

In our first study [11], participants described the effort required to manage DL traffic. If there were few messages, then the DL was effectively out of mind and required little or no effort. If there were many messages, then the DL became burdensome. Several participants cited newsgroups as being less useful because of the large volume of messages. They also mentioned the quality of the messages as being very important, e.g., content, knowledge base of participants, and courtesy. Several participants left newsgroups because of what they perceived as low content quality.

Using figures supplied by participants, DLs with traffic levels of over 6 messages/day were categorized as requiring higher effort to manage. The mean traffic level for the software-support DLs was 3.1 posts/day (see Table 1, column 3). These values fit nicely with our expectations of manageable traffic. However, the mean traffic level of the health-support DLs was 18.4 messages/day, and one

DL exceeded an average of 97 posts/day. These higher-than-expected numbers suggest that these DLs are somehow different than the DLs participants described as being ideal in the first study. Why the discrepancy? It is possible that these DLs supply such high-quality content that their members are willing to put in the higher effort to deal with them. It is also possible that high traffic DLs act like many little DLs, each identifiable by a set of subjects and/or authors. The observed high traffic levels suggest that what is an acceptable and perhaps necessary traffic level in one DL may be unacceptable in another. It also suggests that motivation, in addition to quality of messages, is an important facet of acceptable traffic levels.

Understanding what constitutes acceptable traffic rates is an important issues in designing online communities. E-commerce is already running into this problem. For example, when sending promotional materials through distribution lists, it is important to understand how much email can be sent before customers perceive it as a nuisance. Understanding how DL members cope with and make use of high volumes of messages is important for the designers of email-client software. Lastly, messages from DLs are not received in a vacuum; they compete with messages from a variety of other sources, including personal and professional correspondence, and email from other DLs -based email.

#### **Lurking elsewhere**

This study focused on lurking in DLs as it would not have been possible to measure lurking levels using posting data from either newsgroups or BBSs. However, it is important to understand the limitations of focusing on DLs by examining some of the differences between DLs and both newsgroups and BBSs.

Perhaps the most important difference is that DL messages are received as email. DL email competes with other types of email for the attention of the subscriber. While it is true that most email clients are capable of filtering and depositing email in separate mail boxes, this has not been shown to be the practice of most email users [9, 18].

In contrast to DLs accessed through email clients, Web-based BBSs and newsgroups are accessed through specially built user interfaces. This separates group communication from other non-group communication. Furthermore, the act of retrieving messages from either a newsgroup or a BBS is conscious and deliberate. Email clients often perform the task of retrieving e-mail automatically, e.g., once every 10 minutes. Email clients can also be used to get or check for email on demand. What is not known is whether an active vs. a passive process of obtaining messages has any impact on participation, e.g., reading, browsing, or posting.

There are two other major differences between DLs and the other tools. Firstly, email-based DLs poorly show conversational threading, and secondly, messages can be received as a digest (a single large email containing a set of messages for the purpose of reducing the volume of email).

In both cases, the onus is on the receiver to reconstruct conversational threads. If the continuity of subject headings is to be maintained in the DL, replying to a message received in digest form requires the reply message's subject header to be manually constructed. The lack of visible threading and awkwardness of replying is being addressed by recent advances in digest-reader software [17], but it is not yet a common feature in email clients. In high traffic DLs, the lack of threading and digest format may make it harder to follow conversations. This in turn may make it more difficult to publicly join in the conversation.

In our first study [11], several participants described subscribing to a DL as a form of commitment with associated responsibilities to the other members. They also felt posting to a DL increased their commitment to the group and the presence created through posting should be maintained. Most DLs reinforce this by sending out a welcome message outlining what is expected of members in terms of participation and behaviour. By contrast, there is no subscription process for most BBSs and newsgroups. As a result, participation in DLs may differ from either BBSs or newsgroups, due to a different sense of responsibility to the group.

The effects of different types of email tools and skills have been ignored in this study. However, this could be an important difference between health and software-support DLs and their participants. Software skill and acumen may vary for participants in these DL types. For example, members of software-related DLs may have better computer skills and a greater knowledge of the Internet than those of other DL types.

Personal characteristics that may impact lurking include motivation and comfort in communicating online. To investigate these other approaches are called for. These include member surveys and the examination of DLs from a content and dialogue perspective.

#### **CONCLUSION AND FUTURE WORK**

As this study shows, lurkers are everywhere, and that is OK. A case can be made for lurking being normal and public posting being abnormal. After all, if everyone were posting, who would be reading. It is unfortunate that the term lurker, with all of its negative connotation, has gained acceptance. Fortunately, lurking can now be understood as the many activities related to membership in online groups. Rather than being free-riders, lurkers should be called participants (publicly silent though they may often be).

As a quantitative follow-up of our interview-based study [11], this work proved a capable tool for understanding lurking. There is some irony in studying lurking with a method normally reserved for examining public participation. This work was successful in discovering a number of relationships between lurking levels, DL type, membership levels and traffic. Whether they are causal or not, is left to future work.

The data from this study will continue to be used for follow-up work. Specifically, it will be used to determine whether lurking is related in any way to the diversity of topics within a DL (i.e., breadth vs. depth of the DL), to the distribution of contributions by members of the DL (i.e., the role of stars in a DL), to the response members receive when they delurk, and to the length of messages.

Another area worth pursuing, but perhaps outside of this data set, is the investigation of high-traffic DLs and their members. For example, how do members cope with high traffic levels?

#### ACKNOWLEDGMENTS

Any project of this type requires a wide range of talents. We are indebted to Thawatchai Piyawat and Dick Seabrook for their consummate skills in constructing the Perl scripts and SQL database. Drafts of this paper were considerably improved through the thoughtful comments and editing of Carolyn Davidson and Heather McDonald.

#### REFERENCES

1. Jargon Dictionary. Lurker Definition. Available at <http://www.netmeg.net/jargon>.
2. Katz, J. Luring the Lurkers. Available at <http://slashdot.org/features/98/12/28/1745253.shtml>.
3. Kollock, P., and M. Smith. Managing the virtual commons: cooperation and conflict in computer communities. In *Proc. Computer-Mediated Communication: Linguistic, Social, and Cross-Cultural Perspectives*, edited by S. Herring. Amsterdam: John Benjamins, 1996, 109-128.
4. L-Soft International. List search. Available at [http://www.lsoft.com/lists/list\\_q.html](http://www.lsoft.com/lists/list_q.html).
5. L-Soft International. List with 1,000 subscribers or more. Available at <http://www.lsoft.com/scripts/wl.exe?XS=1000>.
6. L-Soft International. LISTSERV -- The mailing list management classic. Available at <http://www.lsoft.com/listserv.stm>.
7. Mason, B. Issues in virtual ethnography. In *Proc. Ethnographic Studies in Real and Virtual Environments: Inhabited Information Spaces and Connected Communities* (Edinburgh, 1999), 61-69.
8. McMillan, S. J. Who pays for content? Funding in interactive media. *Journal of Computer-Mediated Communication* 4, 1, (1998), Available at <http://www.ascusc.org/jcmc/vol4/issue1/mcmillan.html>.
9. Nonnecke, B. *Lurking in email-based discussion lists*. Ph.D. thesis: SCISM. London: South Bank University, 2000.
10. Nonnecke, B., and J. Preece. Persistence and lurkers: A pilot study. In *Proc. HICSS-33* (Maui, Hawaii, 2000), IEEE Computer Society.
11. Nonnecke, B., and J. Preece. Shedding light on lurkers in online communities. In *Proc. Ethnographic Studies in Real and Virtual Environments: Inhabited Information Spaces and Connected Communities* (Edinburgh, 1999), 123-128.
12. Parks, R. M., and K. Floyd. Making friends in cyberspace. *Journal of Computer-Mediated Communication* 1, 4, (1996), Available at <http://www.ascusc.org/jcmc/vol1/issue4/parks.html>.
13. Preece, J. Empathic Communities: Balancing emotional and factual communication. *Interacting with Computers: The interdisciplinary Journal of Human-Computer Interaction* 5, 2, (1998), 32-43.
14. Preece, J., and K. Ghazati. Empathy online: A review of 100 online communities. In *Proc. Association for Information Systems, 1998 Americas Conference* (Baltimore, MD, 1998).
15. Roberts, T. L. Are newsgroups virtual communities? In *Proc. CHI'98 Conference on Human Factors in Computing Systems* (Los Angeles, CA, 1998), ACM Press, 360-367.
16. Sternstein, M. *Statistics: Barron's Educational Series*, Inc., Hauppauge, NY, 1996.
17. TECHWR-L. About the Digest Reader. Available at <http://www.raycomm.com/techwhirl/digestreader.html>.
18. Whittaker, S., and C. Sidner. Email overload: Exploring personal information management of email. In *Proc. CHI'96* (Vancouver, BC, 1996), ACM Press, 276-283.
19. Whittaker, S., L. Terveen, W. Hill, and L. Cherny. The dynamics of mass interaction. In *Proc. CSCW'98* (Seattle, WA, 1998), ACM Press, 257-264.
20. Worth, E. R., and T. B. Patrick. Do electronic mail discussion lists act as virtual colleagues. In *Proc. AMIA Annual Fall Symposium* (1997), 325-329.