

# Telephone Directory Listings of Presumptive Chinese Surnames: An Appropriate Sampling Frame for a Dispersed Population with Characteristic Surnames

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Choosing an appropriate sampling frame for an epidemiologic study depends on the characteristics of the population under investigation and the sources available for identification of potential subjects. Not all countries maintain (or permit sampling from) population registers. In studies of dispersed populations, electoral rolls may lead to sampling bias, and random-digit dialing is inefficient. A dispersed population characterized by distinctive surnames might be appropriately identified and sampled through telephone directory listings, however. The method proved feasible and efficient for a prevalence study of health-related characteristics of Chinese residents in Melbourne, Australia, yielding a sample demographically comparable to the corresponding census population. (*Epidemiology* 1990;1:405-408)

**Keywords:** sampling, Chinese population, telephone directory, dispersed population, characteristic names.

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Many sampling methods have been devised to obtain representative samples for epidemiologic studies. Comprehensive population registers, when available, permit efficient identification of random samples. Electoral registers have been utilized when population registers are not available. In countries with high telephone service usage, telephones have been extensively employed to define a study sample, especially by means of random-digit dialing (1,2).

For a current health study of persons of Chinese ancestry living in Melbourne, Australia, such sampling methods were considered unsuitable. No population register exists in Australia. At regular censuses, the identifying features of individuals are not recorded. The use of electoral registers in several recent Australian studies of food habits and cardiovascular risk factors led to underrepresentation of non-British migrants (3-5). Permanent residents of non-British origin are not included in the register unless "naturalized." In Melbourne, the Chinese population constitutes less than 2% of the total and is relatively dispersed, nowhere exceeding 5% (Australian Bureau of Statistics, 1986 census, requested tabulation). Although telephone usage is very high among Chinese (6), random-digit dialing would be very inefficient for locating such a small proportion of the population.

Other sampling methods used for studying ethnic

groups include methods based upon multistage probability sampling in private censuses (7) and social network methods in geographically isolated and ethnically homogeneous areas (8-10). The first method is very expensive, and all methods suffer from uncertainty in ascertaining a representative sample. They were considered unsuitable for this study.

Some ethnic groups are distinguished by their family names (11-13). Rutishauser and Wahlqvist exploited this feature for a study of food intake patterns of Greek migrants in Melbourne, using systematically selected surnames from the membership list of a large Greek welfare organization to define a study population from the telephone directory (13). Sanjur (14) describes a similar method used by Chan in a 1977 dietary study of Chinese families in New York. Chinese names were identified in the Manhattan telephone book and a random sample contacted. We employed a telephone directory method to define a representative sample of the Chinese population of Melbourne for the Chinese Health Study, a study of cardiovascular health.

## Subjects and Methods

The Chinese population in Melbourne comprises mainly (1) the descendants of early migrants during the gold rush period (15); (2) Malaysian, Singapore, and Hong Kong Chinese who came to Australia in the 1950s, 1960s, and 1970s; (3) refugees from Vietnam and Cambodia; and (4) recent migrants from Hong Kong (many born in China), Taiwan, and Singapore. The target population of the Chinese Health Study consists of persons of Chinese ancestry 25 to 80 years old, living per-

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manently in the central 43 of 57 local government areas that grouped into seven statistical districts, constitute the statistical division of Melbourne.

In the 1986 Australian census, 46,241 persons resident in the Division identified themselves as being of Chinese ancestry; these people constituted 1.63% of the total population of 2.83 million. Limiting the target population by omission of the 14 outermost local government areas, because of time and cost, excluded 2,321 Chinese (5.0% of the total). The census population includes overseas students and temporary visitors, who were also excluded from the study (16). The Melbourne telephone directory was used as the primary data source for the study sample. The Melbourne telephone district is a local-call area that encompasses 51 of the 57 local government areas of the statistical division and over 95% of its population. Of domestic telephone services, at least 85% are believed listed in the directory.

Several Chinese community organizations based in Melbourne were approached to obtain a surname list of their members. This pooled source yielded 33 distinct family names (Chinese characters) (17). For these 33 names, 123 English "phonetic" spellings were identified as pronounced in the Mandarin, Cantonese, Fukienese, and Vietnamese dialects. Further Chinese names were later found in the telephone directory and added to the list. Most were identified with one of the 33 Chinese characters. This list of 145 names (Table 1) contains all common Chinese surnames and encompasses the major Chinese dialects used in Melbourne. Using the list, 10,223 telephone services were identified in the most recent Melbourne telephone directory then available (1987). Selection of every tenth telephone service provided a systematic sample of 1,022 telephone services, which was used to contact and recruit study subjects.

An introductory letter explaining the purpose of the study was followed two weeks later by a telephone call to ascertain the number of eligible persons residing at the address and their willingness to participate. At the contact stage, many households proved to contain no persons of Chinese ancestry, the name in which the telephone service was registered being usually English (eg, Lee) or Vietnamese (eg, Ly). In other cases, the service turned out to be located at a business address, not a residence. Business contacts were excluded to limit selection bias. Mobility of the listed families proved to be a problem. If the service was still an operational one, it was sometimes possible to obtain the family's new telephone number. During the study, the next (1988) directory became available. For all names on the list where no contact could be made, an attempt was made to

TABLE 1. Common Chinese Surnames and Transliterations According to Dialect of Area of Origin

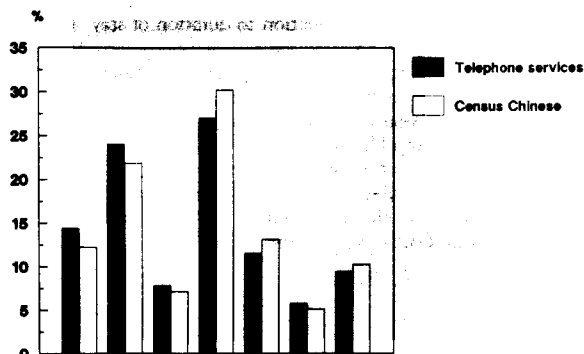
Chinese Script	Family origin					
	Canton	Fukien & Santou	Taiwan (Mandarin)	Other China (Pinyin)	Indo-China	Others
陳	Chan/Chin	Tan	Chen	Zhan	Tran	Ching
錢	Chin		Chien	Qian		
鄭	Cheng	Teh	Cheng	Zheng		
張	Cheung/Cheong	Djeng	Chang	Zhang	Truong	
莊	Chun	Ch'ng/Choong	Chuang	Zhuang		Chua/Chuan
鍾	Chung	Chong	Chung	Zhuong	Chung	
周	Chow	Chew	Chou	Zhou	Chau	Cho
朱	Chu	Chooi/Choo	Chu	Zhu	Chu	
蔡	Choi/Choy	Chua	Tsai	Cai	Thai	
何	Ho	Ho	Ho	He		
胡	Woo/Wu	Ooi	Hu	Hu	Ho	
吳	Ng	Gor/Goh	Wu	Wu	Ngo	
黃	Wong	Ng	Huang	Huang	Huynh	Hoang
王	Wong	Ong/Woon	Wang	Wang	Vuong	
翁	Yung			Weng	Ong	Oon
許	Hu	Khor	Hsu	Xu	Hua	
徐	Tsui		Hsu	Xu	Du	
高	Ko	Koh/Kow	Kau/Kao	Gao	Cao	
鄭	Kwong/Khong	Kwon				
郭	Kok/Kwok	Quan/Kuay	Kuo	Guo	Quach	Kwan
林	Lam	Lim/Ling	Lin	Lin	Lam/Lim	
李	Lee	Lee	Li	Li	Ly	
黎/賴	Lai		Li	Li	Le	
梁	Leong	Leung	Liang	Liang	Luong	
盧	Lo	Lor/Loh	Lu	Lu	Lu	
羅	Law	Loh	Lo	Luo	La	
劉	Lau	Liew/Liow	Liu	Liu	Luu	Lieu
鄧	Tang	Tung	Teng	Dung	Dang	Deng
湯/唐	Tong		Tang	Tang		
楊	Yeung	Yeo/Yeoh	Yang	Yang		Yew/Yao
葉	Yap/Yip/Ip	Ycap	Yeh	Ye	Diep	
Not Stated	Khan Yec	Khoo Yan	Kho Yu	Yuc	Yuen	

identify a new address and telephone service in the new directory.

The spatial distribution of the 1,022 selected telephone services and the demographic features of the persons enrolled in the study were compared with the Melbourne census population of persons of Chinese ancestry, and with that part of it who would be eligible to participate in the study.

## Results

Successful contact with the named person yielded a study population of 547 persons. 52 (5%) of the 1,022 households listed were in the outermost 14 local gov-



**FIGURE 1.** Percentage of the 46,241 persons of Chinese ancestry enumerated in Melbourne at the 1986 census, by statistical region, and percentage of identified telephone services in each region.

ernment areas and were not contacted. In 225 cases, a successful contact with the "listed name" resulted in the discovery of no eligible persons: not Chinese (162 cases); temporary resident, usually a student (22 cases); business listing (31 cases); no person age-eligible (10 cases). 168 households had moved some time before the contact, and their names could not be identified in the new directory. A further 198 were excluded on the grounds of failure of contact (5 attempts), recent removal without contact number available, language difficulties, and refusals. In a few cases, the letter was returned.

Compared with the Melbourne census population of persons of Chinese ancestry, the systematic sample of 1,022 telephone services shows a very similar spatial distribution, by statistical district (Fig 1).

Currently available 1986 census tabulations permit univariate comparisons of the study population with the census population of persons of Chinese ancestry, on the dimensions of age, birthplace, citizenship status, period of residence in Australia, and statistical district of residence within Melbourne (area of residence correlates with socioeconomic status). In most cases, the data are subdivided by sex. No major discrepancies were found. Minor differences in the age distribution and the finding of a higher proportion of recently arrived persons in the census population can be explained on the basis of the inclusion in the census population of overseas students who were ineligible for the study.

## Discussion

Because Australia has no population register, many studies use the electoral register to obtain a population sample. For migrant studies, such a procedure is inappropriate.

Many alternative sampling methods are expensive and inefficient for such dispersed populations. For this study, the Melbourne Chinese community organizations were of great assistance in identifying a surname list and in widely publicizing the study through the Chinese media. A telephone directory was used to obtain a sample that is spatially and demographically unbiased.

The method promises a more complete coverage of eligible individuals than other potential sources. It has the potential to identify individuals without citizenship status and/or who have recently arrived. Although Chinese persons without a telephone service, with an unlisted service, or who have recently moved will be unrepresented or underrepresented, these omissions are not large enough in Melbourne to introduce serious biases to the sample.

Using the telephone directory as a sampling tool is convenient, affordable, and feasible, especially if machine-readable. The method is generalizable to migrant studies in countries where population registers are unavailable and electoral registers are not representative of the population, if telephone service is widely available and used and ethnic groups of interest have distinctive surnames.

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