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# OPTIMUM SIZE OF CITIES

What is the best size for a city? -- The question can only be answered intelligently (if, indeed, there is an answer) by assuming a general viewpoint from which criteria of good, better, and best, can be derived; working out an explicit set of such criteria; and examining the empirical validity of the criteria.

This procedure will be illustrated here by (1) assuming the viewpoint of the theorist of city planning interested in setting general standards for the planning of cities; (2) abstracting from the literature of city planning theory a list of specific criteria which have been offered therein for determining optimum city-size; and (3) examining each of the criteria on the list from the standpoint of observable relationships between city-size and the empirical variables involved in the criteria. The logical justification for this approach rests on the truism that any criterion of optimum population involves, implicitly or explicitly, two elements: first, the normative element, which places a positive or negative valuation on a particular situation; and second, a factual element which has the force of a statement of empirical relationships between variation in city-size and variation in the situation in question.

Suppose a criterion of optimum city-size is that a city's size should be that which is most favorable to the health of its population. This criterion takes health as a positive value, and ill health a negative one. Beyond this, it implicitly posits some significant correlation between city-size and health; for if there were no such correlation, there would obviously be no "most favorable" size, i.e., no optimum.

The establishing by scientific inquiry of a dependable relationship like that implied by a given criterion may be termed a process of empirical validation of the criterion. Normative issues are not involved here: -- the value once assumed, validation of a criterion of optimum city-size is a purely empirical procedure, which, to be

sure, may be carried out more or less adequately, depending on quality of data, soundness of method, and the like.

Clearly, examining optimum city-size from the viewpoint of the city planning theorist provides only one illustration of the proposed procedure for validating the concept of optimum city-size. It is however, not a trival illustration. There is good reason to suppose that the list of criteria furnished by the planning literature includes many criteria which would also be forthcoming under alternative viewpoints. There is the further point that planning standards based on the notion of optimum city-size have historically played an important role in the development of the theory and practice of planning. Some writers on city planning -- notably those influenced by Ebenezer Howard (1) -- have gone so far as to insist that realistic planning presumes some initial consensus as to the desirable size of the urban units planned for; (2) while others have urged that control of city-size is among the most important means of achieving the ends of city planning. (3) Though these may be extreme positions, they are influential ones, as in instanced by the planning efforts got under way in Britain after World War II. (4) Both enthusiasts for and opponents of such positions would do well to subject to searching scrutiny the underlying concept of optimum city-size. Thought and discussion on this question have been jolted by the recent bold proposals for meeting the threat of atomic war by dispersing the urban population. The idea that

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(1) Howard's Garden Cities of To-Morrow first appeared at the turn of the century; it was reissued in 1946 (London: Faber and Faber, Ltd.).

(2) F. J. Osborn, Transport, Town Development and Territorial Planning of Industry. No. 20, The New Fabian Research Bureau (London: Victor Collancz, Ltd., 1934), p. 20.

(3) Lewis Mumford, The Culture of Cities (New York: Harcourt Brace, 1938), p. 488.

(4) Ministry of Town and Country Planning, New Towns Committee. Final Report, Cmd. 6876 (London: H. M. Stationery Office, 1946).

cities should be small enough to have a low probability of atomic destruction is, of course, a criterion of optimum size, and the discussion of this idea has raised anew the question of size considerations in city planning. (5)

General population theory discusses optimum population in terms of an economic criterion applicable, abstractly, to a closed economy. (6) This formulation has little application to the present problem, since cities are intrinsically "open" economies. Though some writers have sought to justify city optima on economic grounds, the economist himself has by and large remained neutral on the question of optimum city-size. (7) The general trend of discussion is in line with Firey's view that in this area explicit recognition should be given to a variety of interests, all having just claims as criteria of optimum population, and not all mediated in any obvious manner by purely economic factors. (8) The criteria considered in this paper are those which appear in discussions of optimum city-size in the literature of city planning and allied disciplines. (9) The classification of these criteria is the

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(5) William F. Ogburn, "Sociology and the Atom," American Journal of Sociology, LI (January, 1946), 267-275; Tracy B. Augur, "The Dispersal of Cities as a Defense Measure," Bulletin of the Atomic Scientists, IV (May, 1948), 131-134.

(6) Manuel Gottlieb, "Theory of Optimum Population for a Closed Economy," Journal of Political Economy, LIII (December, 1945), 289-318.

(7) Paul Samuelson, "The Business Cycle and Urban Redevelopment," The Problem of the Cities and Towns, ed. Guy Greer (Report of the Conference on Urbanism, Harvard University, March 5-6, 1942).

(8) Walter Firey, "The Optimum Rural-Urban Population Balance," Rural Sociology, XII (June, 1947), 116-127.

(9) The following are representative: National Council of Social Service, The Size and Social Structure of a Town (London: George Allen & Unwin, Ltd., 1943); William F. Ogburn, op. cit.; F. J. Osborn, op.cit.; Report of the Royal Commission on the Distribution of the Industrial Population, Cmd. 6153 (London: H. M. Stationery Office, 1940); Thomas Sharp, Town Planning, rev.ed.(Harmondsworth, Middlesex: Penguin Books, 1945); Raymond Unwin, "The Town and the Best Size for Good Social Life," Town Theory and Practice, ed. C. B. Purdon (London: Benn Brothers, Ltd., 1921).

writer's and has merit only for reasons of its convenience. It will be obvious that, at least in the aggregate, planners have been hopeful of attaining far-reaching transformations and ameliorations of the urban way of life through control of city-size. The realism of such hopes is closely bound up with the validity of the concept of optimum city-size.

While the data on which this paper is based are to be summarized rather sketchile, most of them are from published sources; and in any case, there is elsewhere availabe to the specialist a complete and critical exposition of detailed empirical and methodological problems. (10)

Empirical Observations. 1. Physical Plan of the City.- The theorist of optimum city-size frequently demands that cities be small enough to enable ready access to the country-side and a reasonably moderate journey to work. The desirable area of a city is in question here, along with the bearing of area on transportation problems. According to a relationship between population size and area demostrated for our cities as of 1940, (11) the average city of 10,000 will have a radius of one mile; the city of

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(10) Otis Dudley Duncan, "An Examination of the Problem of Optimum City-Size," microfilm (Chicago: University of Chicago Libraries, 1949). See also the following compilations of data on differential characteristics of cities by size: Fenton Keyes, "The Correlation of Social Phenomena with Community Size," Ph.D. dissertation, Department of Sociology, Yale University, 1942; the Municipal Year Book (Chicago: The International City Managers' Association, annual); William F. Ogburn, Social Characteristics of Cities (Chicago: The International City Managers' Association, 1937); U. S. Bureau of the Census, Cities Supplement, Statistical Abstract of the United States (Washington: Government Printing Office, 1944).

(11) John Q. Stewart, "Suggested Principles of 'Social Physics'," Science, CVI (August 29, 1947), 179-180.

100,000 a radius of 2.3 miles; and the city of a half-million 4.1 miles, on the idealized assumption of circular areas. For the average resident, accessibility to the various functional areas of the city varies inversely with its radius. With increasing city-size walking or cycling to work and play rapidly becomes out of the question, and automotive and mass transportation become indispensable. A 1942 survey showed that the average resident of cities over a half-million lived 4.8 miles from work, and required 24 minutes to get to his job. In these cities three-fifths traveled to work by mass transportation media, and three-tenths by auto. In the cities of 5,000-25,000 the median distance to work was but 0.8 of a mile, the journey to work requiring 9 minutes. Fewer than half utilized automotive and mass transportation. Respondents in large cities expressed somewhat more dissatisfaction than those in small cities over parking facilities and the distance their children had to travel to high schools. (12) Some form of local mass transportation is apparently required in cities over 15,000, since virtually all cities of this size have buses or street cars. (13) The automobile is a much less effective mode of transit in the large city: A fragmentary survey in 1942 indicated that in cities of 25,000-100,000 about four-fifths of vehicular passengers arriving in the central business district travelled by auto, as against only two-fifths in cities over a half-million; the remainder in each case arrived by some means of mass transportation. (14) Families in cities over 100,000 spend more than four times as much

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(12) Melville C. Branch, Jr., Urban Planning and Public Opinion (Princeton: Princeton University Bureau of Urban Research, 1942).

(13) "Suburbs' Growth Expands Use of Cars," Automobile Facts, III (March, 1944), 1, 3.

(14) Kendrick Lee, "Local Transportation," Editorial Research Reports, I, No. 18 (May 15, 1942), 311-325.

for non-automotive transportation as families in smaller cities. (15)

Although the statistical data are not adequate for a thorough cost analysis of transportation, the unequivocal indication is that the advantages of time, expenditure, and convenience all lie with the moderate sized or small city.

2. Health.- One of the most frequently mentioned criteria of optimum city-size concerns the environmental and institutional aspects of the city-dweller's health. It can readily be shown that the ratio of physicians to population increases with increasing city-size, at least up to the million mark, with even more marked differences between large and small cities in the ratios of medical specialists to population than holds for general practitioners. Of the eleven numerically most important types of medical specialists, eight are regularly found only in cities over 50,000 population (as indicated by a ratio of one such physician per city). (16) Ninety-five per cent of the cities over 10,000 have general hospitals, as compared to three-fourths the cities of 5,000-10,000 and two-fifths the cities of 2,500-5,000 and the model size of these hospitals varies directly with city-size. (17) Nine-tenths of the births to residents of cities over 10,000 now occur in hospitals, as compared to three-fourths in the case of cities below 10,000; and over half the large city

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(15) National Resources Planning Board, Family Expenditures in the United States, Statistical Tables and Appendices (Washington: Government Printing Office, 1941), Tables 1, 196, 198, 200, and 202.

(16) R. G. Leland, Distribution of Physicians in the United States (Chicago: Bureau of Medical Economics, American Medical Association, rev. ed., 1936).

(17) Commission on Hospital Care, Hospital Care in the United States (New York: The Commonwealth Fund, 1947), Table 14.

deaths occur in hospital beds as compared to one-third in the smaller centers. (18) Health services and facilities are, therefore, clearly more accessible to large city residents than to small.

The actual health status of the populations of different sized cities is perhaps most reliably, though indirectly, shown by mortality statistics. Infant mortality varies inversely with city-size, and in recent years the smallest cities have had rates two-fifths larger than cities over the million mark. The association with city-size is uniform, and the differentials by city-size have increased, rather than diminished, with the nation-wide improvements in infant mortality rates of the past three decades. (19) Likewise, the larger cities experience an advantage with regard to maternal mortality, though here the differences are smaller-perhaps of the order of ten per cent -- and have diminished considerably in recent years. (20) For combined sexes in the total white population, the life expectancy at practically all ages was higher in 1940 for residents of cities of 10,000-100,000 than for residents of cities larger or smaller than this. The superior longevity in this city-size group is a function of age, increasing to age 35 and being most marked in the age range 35-65. However, at best these cities experience only a three per cent superiority over larger cities, and a much narrower margin over smaller cities. (21) Further, there are important

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(18) U. S. Bureau of the Census, Vital Statistics--Special Reports, vol. 22, no. 1, 1945; and vol. 10, no. 51, 1941.

(19) U. S. Bureau of the Census, Vital Statistics of the United States (Washington: Government Printing Office, annual).

(20) Ibid.

(21) Life tables computed from data in U. S. Bureau of the Census, Vital Statistics Rates in the United States, 1900-1940 (Washington: Government Printing Office, 1943).

variations by population subgroups. In the West and the North, life expectancies of both races are higher in the smaller cities, but the reverse is true in the South. In general, the advantage of the smaller cities increases with advancing age, amounting to as much as 5 to 15 per cent at the old ages in the North and West. (22) Among the important causes of death, large cities have the highest death rates from cancer, heart disease, tuberculosis, diabetes, stomach ulcers (white population), and suicide. Small cities have higher rates for pneumonia and influenza, appendicitis, intracranial lesions, nephritis, and hernia and intestinal obstruction. (23) Recalling the higher infant and maternal mortality of the small cities, and the fact that their life expectancies are relatively greater at advanced than at early ages, there is, therefore, some indication that the principal health advantages of the large cities are in regard to the immediate accessibility of superior services for the treatment of acute diseases and chil-birth; whereas the populations of these large urban centers are more vulnerable to the long-term, accumulative environmental hazards eventuating in chronic and psychosomatic disorders. This picture is, of course, much different nowadays from that of a few decades ago before the control of epidemic infectious diseases. Recent advances in public health have presumably benefited the large cities more than the small. It is impossible to make a categorical generalization about the relative advantages of large and small cities with regard to health; but the probability is that the magnitudes of the historical differences in the health of populations in cities of different sizes are diminishing, on the whole.



(22) U. S. Bureau of the Census, Vital Statistics-Special Reports, vol. 23, no. 15, 1947, Table IV.



(23) U. S. Bureau of the Census, Vital Statistics-Special Reports, vol. 23, no. 1, 1945.

| City-Size: | 100,000 and Over | 25,000-100,000 | 10,000-25,000 | 2,500-10,000 |
|---|---|---|---|---|
| Per cent of cities with psychiatry clinics, 1947 | 83 | 25 | 4 | 1 |
| Per cent of births occurring in hospitals, 1943 | 92 | 88 | 84 | 74 |
| Infant deaths per 1,000 births, 1948 | 29 | 31 | 33 | 36 |
| Life expectancy, 1940: | | | | |
| -At birth (sexes combined) | 64.3 | 64.0 | | 62.5 |
| -At age 45 (sexes combined) | 26.0 | 26.7 | | 26.6 |
| Age-adjusted death rates per 100,000 population, 1940: | | | | |
| -From heart and circulatory diseases | 354 | 309 | | 295 |
| -From pneumonia and influenza | 64 | 67 | | 77 |

3. Public Safety.- It is sometimes stated that small cities are safer places in which to live than large cities. This assertion may be checked against the statistics of crime, auto accident deaths, and fire losses.

Most of the 24 offense categories used in Uniform Crime Reports show a tendency for crime rates, as measured by crimes known to police, or by persons charged, to increase with city-size. The relationship is not always of a simple character, but in general cities over 50,000, though the vary largest cities by no means have the highest rates in all or most of these categories. (24) Lacking

(24) Federal Bureau of Investigation, Uniform Crime Reports (Washington: Government Printing Office, Semiannual).

data to measure directly the cost of crime, it may be observed that per capita expenditures for city police forces increase directly with city-size, differences among city-size groups being of the order of three or four to one, comparing cities over a half million to cities below 10,000. (25) A similar comparison for per capita size of police force gives a ratio of roughly two to one. (26) These ratios of differential effort and expenditure are greater than the ratios of differential incidence in most categories of crime. Therefore, it may be generalize that the large city not only experiences a greater relative amount of crime, but also pays proportionately more heavily for it.

Statistcs of automobile accident death rates are none too reliably compiled, and consequently exhibit certain illogical irregularities over the years. In general, occurrence rates based on population are lower for cities between 10,000 and 50,000 than for larger cities, for the recent years for which data are relatively complete. Occurrence rates based on numbers of registered vehicles give a somewhat clearer picture. Again cities of 10,000-50,000 have the lower rates, with the rates increasing regularly with city-size in the statistics of recent years. Although it is not entirely clear in what size group of cities there is the greatest personal risk of dying in an auto accident, it is obvious that the larger the city, the more lethal and instrument the automobile becomes. And it seems fairly clear that the cities below 50,000 enjoy the greatest safety from auto accidents, by perhaps ten per cent as measured by population based rates, and by a much larger

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(25) U. S. Bureau of the Census, City Finances: 1942, Vol.III; and Finances of Cities Having Populations Less Than 25,000: 1942 (Washington: Governmental Printing Office, 1944).

(26) Uniform Crime Reports, op. cit.

margin in relation to the number of automobiles owned by residents. (27)

| City-Size Group | Average Annual Auto Accident Deaths per 100,000 Vehicles, 1942-46 | Per Capita Policy Expenditure, 1942 | Average Annual Criminal Offense Rate per 100,000 Population, 1940-1947 | | |
|---|---|---|---|---|---|
| | | | Murder | Robbery | Rape |
| 1,000,000 + | 68 | $6.71 | 5 | 73 | 14 |
| 500,000 - | 54 | 5.80 | 8 | 74 | |
| 250,000 - | 50 | 3.80 | | | |
| 100,000 - | 46 | 3.57 | 7 | 56 | 11 |
| 50,000 - | 40 | 3.37 | 6 | 40 | 9 |
| 25,000 - | 35 | 2.89 | 4 | 29 | 7 |
| 10,000 - | 35 | 2.34 | 4 | 23 | 8 |
| 5,000 - | " | 2.06 | 4 | 22 | 8 |
| 2,500 - | " | 1.64 | | | |

In regard to fire hazards, the results vary according to the statistical measure chosen. Per capita fire loss, in dollars, shows little systematic association with city-size, except for the possibility that within a given city-size group, there is greater variation in the scale of losses by individuals cities among the smaller cities. This would indicate a greater vulnerability of the small city to losses from an occasional large fire. (28) Fire loss expressed as a percentage of total real property value is larger in the cities of 30,000-50,000 than in the cities over 1,000,000, the differences being greater when measured by the size group mean that when measured by the size group median - again indicating

(27) National Safety Council, Accident Facts, Annual editions of 1933-1947.

(28) The Municipal Year Book, op. cit., editions of 1940 and 1945.

a skewing toward extreme values among smaller cities. (29) The annual number of fires per capita is related inversely to city-size, with fires being relatively one-third more frequent in cities 25,000-50,000 than in cities 500,000 and over. (30) On the other hand, the loss per building fire is more than fifty per cent greater in the larger of these two city-size groups. (31) There are only slight differences by city-size in regard to per capita size of fire departments, but the cities over a half-million spend 15 per cent more for them in relation to their population, than do the cities of 10,000-25,000. (32) While there is no unequivocal measure of fire hazard and of fire-fighting efficiency, the suggestion is that among all sizes of city larger than 25,000 the differences in fire losses are rather due to inherent fire hazards than to differences in the mobilization of resources for fire protection. While the choice among the above quoted indices is somewhat subjective, perhaps a fair case could be made for the greater safety of the small or medium sized city, on the average.

In most persons' minds, no doubt, the preeminent question about a city's public safety nowadays is its potential destruction by the Bomb in a future war. Fortunately, there are no statistics on the relative vulnerability of cities of different sizes to A-bombs; we have to rely on statements of authorities and certain a priori considerations. The question is not, of course, one of the destructive power of the Bomb in a direct hit, but rather of the probability of a city's suffering such a hit. It has been argued

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(29) Mabel L. Walker, Municipal Expenditures (Baltimore: The Johns Hopkins Press, 1930), Table II.
(30) The Municipal Year Book, op. cit., annual editions of 1941-1945.
(31) Ibid.
(32) The Municipal Year Book, 1945, op. cit.

that the small city is safer, first because it is a smaller target, more difficult to locate and hit directly; second, because it is likely to be a less attractive target; and third, because the potential enemy's A-bomb supply may be limited, thus diminishing the probability of an A-bomb attack on any given small city. From considerations such as these, the National Security Resources Board urges that "further urban concentrations of more than 50,000 people . . . be avoided." (33)

4. Municipal Efficiency.- It is a plausible hypothesis that the efficiency with which municipal services can be rendered should increase with increasing city-size to a point of diminishing returns, with an optimum size somewhere between the extremes. However, it is virtually impossible to get data to test this hypothesis. The existing data on municipal expenditures show, in general, a direct relationship between city-size and per capita costs in most of the 14 categories of expenditure: The larger cities spend more for highways, sanitation, public welfare, correction, schools, etc., than small. (34) However, these data reflect the separately varying factors of unit costs, amount, and quality of services. Hence they show little about municipal efficiency. From previously cited data, it may be seen that despite their greater expenditures, the large cities apparently enjoy no better situation than small with regard to crime and traffic control, fire protection, or health. This would argue that either these services are rendered less efficiently in large cities, or -- what is more probable -- that the initial problems of large cities are intrinsically more difficult. On the other hand, as will appear later, the higher levels

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(33) National Security Factors in Industrial Location, NSRB Doc. 66 (Washington: National Security Resources Board, rev., July 22, 1948), p. 4.

(34) City Finances: 1942, op. cit.; Finances of Cities Having Populations Less Than 25,000: 1942, op. cit.

of expenditure for schools, libraries, and recreation apparently reflect greater amounts and/or qualities of these services. Whether the increment of service is commensurate with the increment of cost cannot be accurately judged.

In only one area of municipal service can some tentative optimum population be established -- the provision of residential electric service. Unit costs decline with increasing city-size up to the million mark with cities between a half and one million getting electricity the cheapest. (35) Except for this one observation -- which can by no means be immediately generalized -- optimum city-size from the standpoint of municipal efficiency is still terra incognita.

5. Education and Communication.- A variety of measures of city school systems may be cited. Larger cities have longer schools years -- one week longer in cities over 100,000 as compared to those below 10,000. But the difference is smaller in regard to average per pupil school days attended. The average annual salary of teachers increases markedly with city size, quite overshadowing any cost-of-living differentials. Likewise, per pupil expenditures of large city schools exceed those of small city schools, and a greater proportion of the total school budget goes directly into costs of instruction. Large cities are much more frequently able to provide such special services as summer schools and night schools. On the other hand, the pupil/teacher ratio is greater in large cities though the difference between large and small

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(35) Cities Supplement, Statistical Abstract of the United States, op. cit., Table 4.

cities is only of the order of ten per cent. (36)

Facilities for advanced education are considerably limited by city-size. If we somewhat arbitrarily estimate the "population base" for a facility as that city-size at which 50 per cent of cities have the facility, the population base for a college or university is around 100,000, about the same for a junior college, and about 25,000 for a business college. (37) Accredited professional schools in such fields as business, engineering, law, medicine, and social work require larger population bases, of the order of 500,000. (38)

Despite the demonstrably superior educational facilities of large cities, their populations are at but slightly higher levels of educational status than those of small cities. As between cities of 250,000 and over and those below 25,000 superiorities of 0.2-0.3 in median school years completed are typical for ages below 18, but the slight observed differences amongst the adult populations are not all in this same directions. (39)

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(36) U. S. Office of Education, "Statistics of City School Systems 1937-1938)," Biennial Survey of Education in the United States, Bull. No. 2, 1940 (Washington: Government Printing Office, 1940), Ch. III; and "Statistics of City School Systems 1939-1940 and 1941-1942," Biennial Surveys of Education in the United States 1938-1940 and 1940-1942 (Washington: Government Printing Office, 1944). Vol. II Ch. VII.

(37) Clarence Stephen Marsh, ed., American Universities and Colleges (Washington: American Council on Education, 4th ed., 1940); Directory of Private Business Schools in the United States (Washington: War Emergency Council of Private Business Schools 1943); Directory of Junior Colleges, 1941 (Washington: American Association of Junior Colleges, 1941).

(38) U. S. Office of Education, Education Directory 1941, Part III, Colleges and Universities, Bulletin 1941, No. 1 (Washington: Government Printing Office, 1941).

(39) U. S. Bureau of the Census, Sixteenth Census of the United States: 1940. Population. Education, Educational Attainment of Children by Rental Value of Home (Washington: Government Printing Office, 1945), Table III; and Educational Attainment by Economic Characteristics and Marital Status (Washington: Government Printing Office, 1947), Table 17.

With regard to agencies of public enlightenment other than schools, estimates of population bases have been made as just indicated. For an art museum the population base is 100,000, with a somewhat higher figure for science and historical museums. The population base for a public library is 2,5000, for a daily newspaper 5,000, for a radio station 10,000, for an FM station 50,000, and for television 500,000. Current trends suggest a raising of the required population base in the future for newspapers, and a lowering for libraries, FM, and television. (40)

| City-Size Group | School Expenditures Per Pupil 1937-38 | Median School Years Completed Native White Males 18-44, 1940 | Per Cent of Cities with-- College or University 1940 | Art Museum 1938 | Am Radio Station, 1946 |
|---|---|---|---|---|---|
| 250,000 + | $120 | 11.0 | 100 | 86 | 100 |
| 100,000 - | | | 56 | 53 | 89 |
| 50,000 - | 99* | 11.2† | 43 | 25 | 72 |
| 10,000 - | 85* | | 19 | 4 | 39 |
| 2,500 - | 75 | 11.1† | 6 | 1 | 5 |

* The dividing line between these two groups is 30.000, rather than 50,000.

† The dividing line between these two groups is 25,000, rather than 10,000.

A more detailed analysis of libraries shows that they generally meet desirable minimum professional standards only in cities as large as 50,000- 75,000. (41) Although libraries in large cities

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(40) Laurance Vail Coleman, The Museum in America (Washington: The American Association of Museums, 1939), Vol. III; The American Library Directory, 1939 (New York: R. R. Bowker Co., 1939); Directory, Newspapers and Periodical, 1946 (Philadelphia: N. W. Ayer & Son, 1946); Directory, of Broadcasting Stations of the United States Broadcasting, 1946 Yearbook Number, pp. 71-190; Jack Alicoate, ed., The 1947 Radio Annual (New York: Radio Daily, 1947).

(41) Lowell Martin, "The Optimum Size of the Public Library Unit," Library Extension: Problems and Solutions, ed. Carleton B. Joeckel (Chicago: University of Chicago Press, 1945), pp. 32-46.

have larger book stocks and spend more money per capita, their service to the population is less as measured by per capita book circulation. For a example of 103 cities in 1943 there was a negative correlation of -.64 between city-size and per capita circulation. Holding constant percent of population registered as borrowers, book stock in volumes per capita, branch libraries per capita, and per capita expenditures, the correlation remained at -.51. (42) Another writer has demonstrated a negative correlation between city-size and per capita museum attendance. (43) Apparently for those facilities which do not operate by mass distribution, the superior facilities of the large city are purchased at the price of diminished community participation.

(6) Public Recreation.- An accepted professional standard for park acreage is one acre per 100 population. This standard is attained by one-fifth the cities between 50,000 and 250,000, by practically no city above that size, and by somewhat lesser percentages of the smaller cities. Parks in large cities have a much wider variety of recreation facilities, special use areas and buildings, and spend larger per capita amounts for operation and maintenance. On the other hand, the accessibility of parks, as indicated by the number of parks per capita is much greater in the small cities. In those cities reporting parks there are four for every 10,000 persons in the city of 25,000-50,000 as compared to 1 in the city over 1,00,000. (44) The optimum population for parks, on any equilibrium of these four variables, is clearly in the middle size range of cities.

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(42) Original data taken from "Public Library Statistics," Bulletin, American Library Association, XXXVIII (April 1944), 154-167.

(43) Paul Marshall Rea, The Museum and the Community (Lancaster: The Science Press, 1932).

(44) National Recreation Association, Municipal and County Parks in the United States, 1940 (New York: National Recreation Association, 1942).

The population base for zoos (estimated as before) is 100,000; (45) approximately the same figure holds for symphony orchestras. (46) Resident grand opera is found in only three or four of the country's largest cities, and the population base for opera of any sort is apparently above a quarter million. (47) On the other hand, motion picture theaters are found in every city, and even cities as small as 10,000-25,000 have variety and choice of cinematic offerings, with an average of three movies each. (48)

| City-Size Group | Per Cent of Cities with-- At Least One Park Acre Per 100 population 1940 | Park Expenditure of at Least $1.00 Per Capita, 1940 | Zoo, 1940 | Symphony Orchestra, 1946 |
|---|---|---|---|---|
| 1,000,000 + | 0 | 80 | 100 | 100 |
| 500,000 - | 0 | 100 | 100 | 89 |
| 250,000 - | 9 | 58 | 76 | 78 |
| 100,000 - | 20 | 42 | 57 | 55 |
| 50,000 - | 21 | 42 | 32 | 18 |
| 25,000 - | 17 | 27 | 15 | 5 |
| 10,000 - | 15 | 14 | 8 | 0 |
| 5,000 - | 14 | 13 | 2 | 0 |
| 2,500 - | 12 | 7 | 1 | 0 |

7. Retail Facilities.- The oft mentioned values of the large city as a shopping center cannot be denied. However, in many standard lines of merchandise this advantage is slight, the real superiority of the large city being in style and specialty trade. It is

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(45) Ibid.
(46) "Symphony Orchestras in the United States and Canada," The International Musician, XLIV (June, 1946), 7-8.
(47) Pierre Key's Music Year Book, 1938 (New York: Pierre Key, 1938).
(48) Motion Picture Theatres in the United States: A Statistical Summary, 1948 (New York: Motion Picture Association of America, Inc., 1948).

worth observing that in no more than three of the 65 kinds of retail outlet listed by the census is a population base of over 50,000 apparently required. (49) Another study suggests that for some lines of specialty goods, stores in the largest cities apparently have no more "drawing power" for non-resident trade than those in cities of 100,000. (50) The optimum city population for adequate retail outlets, even for specialized trade, may therefore be no higher than 50,000 to 100,000.

8. Churches and associations.- Criteria of optimum city-size involving the organized group life are ordinarily not precisely stated. Rather there is usually some general reference to the desirability of a certain degree of variety and diversity of groups, preferably without too much loss of community consensus and cohesion. The following data will doubtless seem somewhat tangential to this formulation.

There are only 20 religious denominations in the United States (1936) which have as many as 1,000 urban local churches. These cover three-fourths of all local churches and nine-tenths of all memberships in urban areas. Perhaps 20 could therefore be regarded as a generous estimate of the minimum desirable number of denominations. From census data on number of denominations per city, it is estimated that 30,000 is the population base for this degree of denominational variety. (51)

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(49) Population base estimated as city-size where number of stores per city is 1.0, by graphic interpolation; U. S. Bureau of the Census, Sixteenth Census of the United States: 1940. Census of Business: 1939. Retail Trade Analysis by City-Size Groups (Washington: Government Printing Office, 1942), Table 12C.

(50) John Adams Pfanner, Jr., A Statistical Study of the Drawing Power of Cities for Retail Trade (Studies in Business Administration, The Journal of Business of the University of Chicago, Vol. X, No. 3, April, 1940).

(51) U. S. Bureau of the Census, Religious Bodies: 1936, Vol. I. Summary and Detailed Tables (Washington: Government Printing Office, 1941), Table 13.

There are no comparative statistics on the variety of voluntary associations present in cities of different sizes, and only fragmentary data on certain national organizations. From these, the estimated population bases for certain kinds of organization are as follows: Rotary Club, 5,000; Elks lodge, 10,000; Lions Club, 15,000; Boy Scout Council, 25,000; YMCA, 25,000; YWCA, 25,000. (52) The population base for any two or more of these would be somewhat higher, but in all probability most organizations of these types are well represented in cities no larger than 25,000-50,000.

9. Family Life.- Advocates of small cities and decentralization often stress the greater strength of the family institution in small cities. Statistical support for this position may be found in the data on marriage and fertility. Of the native white population 18-64, only three-fifths are married in cities over a quarter million as against over two-thirds in cities 2,500-25,000. (53)

In 1940 no city-size group in the urban white population had a fertility level up to the permanent replacement quota. The cities of 2,500-10,000 were reproducing at 15 per cent below replacement, whereas cities over 1,000,000 were 35 per cent below. (54) In previous census periods the persistent inverse association of city-size and effective fertility has also been marked.

Another important aspect of family living-housing-has been minutely described by the 1940 census. The principal differentials by city-size are as follows: Home ownership is more frequent in small cities; rental increase with increasing city-size; and owner-

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(52) Official Directory 1935-1936 (Chicago: Rotary International, 1935): Keyes, op. cit., p. 162.

(53) U. S. Bureau of the Census, Educational Attainment by Economic Characteristics and Marital Status, op. cit., Table 37.

(54) Warren S. Thompson, The Growth of Metropolitan Districts in the U. S.: 1900-1940 (Washington: Government Printing Office, 1947); and special computations from 1940 Census data.

occupied units are less frequently mortgaged in small cities. Thus both ownership and rental are easier propositions in the smaller centers. Dwelling units in large cities are better equipped with regard to private bath, running water, central heating, flush-toilet, mechanical regrigeration, and gas or electric cooking. They are also in better repair, being somewhat newer on the average. In small cities a majority of dwelling units are in single family structures, whereas the reverse is true of large cities. However, there is somewhat more room overcrowding in small cities, as measured by the standard of more than one and one-half persons per room. (55) In sum, not all the advantages in regard to good housing lie with any one size group of cities.

| | Cities of-- | | | |
|---|---|---|---|---|
| Housing Characteristics, 1940 | 250,000 and Over | 50,000-250,000 | 10,000-50,000 | 2,500-10,000 |
| Home ownership | 29% | 38% | 45% | 49% |
| Average rent, tenant units | $32 | $25 | $23 | $18 |
| Single family units | 33% | 51% | 61% | 71% |
| Room overcrowding | 5% | 6% | 6% | 7% |
| Units needing major repairs | 8% | 11% | 14% | 17% |
| Units without running water | 3% | 6% | 8% | 15% |

10. Miscellaneous Psychological and Social Characteristics of Urban Life.- There remains a residual category of attributes, desirable and undesirable, which are sometimes mentioned as criteria of optimum city-size. Such epithets as provincialism, friendliness, community participation, standardization, anonymity, strain, spontaneity, and the like are perhaps applied with more heat than light in the absence of precise specification and reliable measurement of such urban traits.

(55) Housing-Special Reports, Series H-44, Nos. 1-7 (Washington: U. S. Bureau of the Census, 1944-1945).

One writer claims to find evidence of greater "social contentment" in cities below 25,000 in the fact that survey respondents there voice fewer complaints on certain questions about neighborhood and community characteristcs. (56) Another attempt to get at some of the more intangible traits of cities through an analysis of student community reports (57) must be deemed methodologically unsound.

There is but one trait of this miscellany for which some approximate measurements can be made. This is the status of the city as a center of innovation and cultural diffusion. Rose's data indicate a positive correlation between city-size and cultural innovation. (58) Bowers has shown that amateur radio followed a diffusion cycle from large to small cities. (59) Data assembled for the present study indicate that commercial braoadcasting, FM, and television follow a similar pattern. Another kind of measurement is the per capita incidence of persons in certain eminence groups. Inventors, artists, and persons in Who's Who are present in greater numbers, relative to population, in large cities than in small. (60)

Discussion. The above summary of a considerable mass of data leads to the following comments: The optimum size of cities is quite different from the standpoint of certain criteria from what it is on the basis of others. It is found that even an apparently

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(56) Branch, op. cit., p. 31.
(57) Walter T. Watson, "Is Community Size an Index of Urbanization?" The Southwestern Social Science Quarterly, XVII (September, 1936), 150-160.
(58) Edward Rose, "Innovations in American Culture," Social Forces, XXVI (March, 1948), 255-272.
(59) Raymond V. Bowers, "The Direction of Intra-Societal Diffusion," American Sociological Review,II (Dec., 1937), 826-836.
(60) Sample of inventors from U. S. Patent Office, Index of Patents, 1940 (Washington: Governemnt Printing Office, 1941); sample of artists from Who's Who in American Art, Vol. III, 1940-1941 (Washington ; The American Federation of Arts, 1940); R.D. McKensie, The Metropolitan Community (New York: McGraw-Hill Book Co., Inc.,1933), Table 48.

unitary criterion -- e.g. health -- may give conflicting indications of the optimum. There is no immediately obvious way in which these various optima may be objectively equilibrated, compromised, weighted, or balanced to yield an unequivocal figure for the optimum population for a city. Any numerical choice of a figure for the optimum population is involved in subjective value preferences and impressionistic weighting systems. Most theorists proposing a size or size range as the optimum adopt this procedure, or the alternative one of confining attention to a few of the many criteria of optimum city-size that have been proposed in the literature. Thus if the preeminent interest is in the planning of cities for safety in atomic war, some population, say 25,000 or 50,000, will be taken as a maximum desirable city-size. Some other interests will be compatible with this choice, e.g. those of physical plan, health, and public safety. Attention to the remaining criteria which indicate larger sizes is then shifted to a consideration of the sacrifices involved in limiting city-size. Data such as those cited in this paper furnish the starting point for such a consideration, assuming the relationship between city-size and urban characteristics to be those of the present time. The degree to which city and national planning could mitigate these sacrifices is a question which is still open, scientifically speaking, though there is no dearth of assertion on the subject.

The problem of optimum city-size originates in the realm of values and, ideally, eventuates in action. Only the middle term of the translation of values into action is open to scientific procedures, for the choice of values and the decision to act are intrinsically beyond the scope of science. Nevertheless, both valuation and action should profit from an occasional summing up of the evidence and its implications. This paper has reported an initial effort of that kind.

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