COMMENTARY

HOUSING QUALITY AND DATA QUALITY

TRUMAN A. HARTSHORN'S recent article dealing with housing quality, its spatial patterns, and its relation to certain socioeconomic characteristics, contains several major deficiencies.[1] These relate to the definition, content, and dependability of the housing quality data upon which the bulk of the analysis depends.

First, Hartshorn did not define exactly what features of housing quality he analyzed. He spoke of "low quality housing" and "substandard housing," and stated that he used the terms interchangeably.[2] Two of the variables used in the analysis are labeled "percent dilapidated" and "percent sound dwelling units."[3] At another point a distinction is made between "sound and deteriorated housing."[4]

Hartshorn stated that his data were drawn mostly from the Census city block statistics for the years 1940, 1950, and 1960, and that he worked with blocks containing "substandard housing."[5] However, examination of the block statistics reports does not answer unequivocally the question of what aspects of quality were analyzed. The three censuses contain a variety of column headings which relate directly to housing quality.[6] Some of these headings involve terms Hartshorn used, but he did not mention others. Conversely, the words "low quality" and "substandard" do not occur in any column heading.

Received 10 January 1972.

Examination of the headings reveals that the Census block statistics of all three years deal with two distinct aspects of housing quality. One relates to the dwelling as a structure, in terms of its state of repair or its adequacy as a shelter. The column headings "Needing repair," "Dilapidated," "Sound," "Deteriorating," are concerned with this aspect, which I shall call structural condition. The other aspect relates to the presence or absence of certain plumbing facilities for the exclusive use of the inhabitants of each dwelling unit. Column headings such as "No private bath," "Lacking some or all facilities," and "No running water," relate to this aspect, which I shall refer to as plumbing facilities.

The terms "standard" and "substandard" do not appear in census publications, but they are used officially by the Housing and Home Finance Agency (HHFA) and by other Federal agencies, and as such have specific meanings. For example, using 1960 Census classes, a substandard unit is one which is dilapidated, or which lacks one or more of the following plumbing facilities: hot running water in the structure, flush toilet for the private use of the household, and bathtub or shower for the private use of the household.[7] Hartshorn used the term "dilapidated" when he meant substandard, and the term "sound" when he meant not substandard.[8] Beyond mere misuse of terminology, Hartshorn used data on substandard dwelling units to draw inferences on building maintenance trends in the Cedar Rapids study area.[9] However, nowhere did he state the fact that a large percentage of these substandard units was so classified solely because they lacked certain plumbing facilities, and not because they were rated as deficient in structural condition.

A second problem is Hartshorn's failure to indicate clearly which housing quality variables from the block statistics he employed in his analysis. One must reconstruct his method by comparing blocks from his maps of increases in substandard and sound housing with the

[1] Truman A. Hartshorn, "Inner City Residential Structure and Decline," *Annals*, Association of American Geographers, Vol. 61 (1971), pp. 72–96.

[2] Hartshorn, op. cit., footnote 1, footnote 40, pp. 78 and 79.

[3] Hartshorn, op. cit., footnote 1, Table 1, p. 79.

[4] Hartshorn, op. cit., footnote 1, p. 87.

[5] Hartshorn, op. cit., footnote 1, footnote 39, p. 78.

[6] Bureau of the Census, *16th Census of the United States: 1940, Housing*, Vol. I, *Block Statistics*, Supplement to the First Series Housing Bulletin for Iowa, Cedar Rapids (Washington: Government Printing Office, 1941), Table 3, pp. 6–17; Bureau of the Census, *U.S. Census of Housing: 1950*, Vol. V, *Block Statistics*, Part 29, Cedar Rapids, Iowa (Washington: Government Printing Office, 1952), Table 3, pp. 4–15; and Bureau of the Census, *U.S. Census of Housing: 1960*, Vol. III, *City Blocks*, Series HC(3), No. 158, Cedar Rapids, Iowa (Washington: Government Printing Office, 1961), Table 2, pp. 1–15.

[7] Bureau of the Census, *Measuring the Quality of Housing: An Appraisal of Census Statistics and Methods*, Working Paper No. 25 (Washington: Government Printing Office, 1967), p. 2.

[8] Hartshorn, op. cit., footnote 1, pp. 94 and 95.

[9] Hartshorn, op. cit., footnote 1, p. 92.

block statistics reports until the correct combinations of variables can be deduced.[10] Apparently he derived the number of substandard units from the following combinations of block statistics data:

1940: all dwelling units needing repair or having no private bath

1950: all dwelling units dilapidated or having no private bath

1960: all dwelling units sound and lacking some or all facilities, or deteriorating and lacking some or all facilities, or dilapidated

The third problem involves the arithmetic technique used to measure change in the number of substandard units per block, and the measure's relationship to changes in the total number of dwelling units within a block. Hartshorn expressed the number of substandard units as a percentage of total units, and stated that this procedure had the advantages of facilitating comparisons and of minimizing the effects of block size variation.[11]

However, this ratio or percentage technique has certain deficiencies. Over a decade the housing stock of city blocks can be expected to change not only in structural condition and plumbing facility supply, but also in the total number of dwelling units. Hartshorn seemed to recognize the possibility of such quantitative change by his references to new construction and demolition, but the number of dwelling units can also be changed by other processes.[12] Such processes were implied in Hartshorn's references to renewal, rehabilitation, and code enforcement, but no specific comment was made on their potential impact on housing stock quantities.[13] Quantity can be increased by creating more from fewer units: for example, the conversion of a one-family house into two dwelling units. Quantity can also be increased by the transfer of building space from non-dwelling unit to dwelling unit use, such as changing a hotel for transients into an apartment house. Conversely the total number of dwelling units can be reduced by merger, the reverse of conversion, or by the transfer of space from

dwelling unit to non-dwelling unit use: for example, changing a one-family house or an apartment house into a nursing home or a dormitory. These latter establishments, called group quarters by the Census Bureau, are not rated for structural condition or plumbing facilities, although their inhabitants are enumerated.

An intradecade change in the number of dwelling units on a block can be caused by any of these processes, or the processes can balance each other out, resulting in a zero net change. The processes can directly affect the absolute number of substandard units, for example, through the demolition of a dilapidated house, or through the merger of a two-family house with shared bath. The percentage of substandard units can also be changed for reasons which bear no relationship to substandard housing, and by actions which do not destroy or create substandard units. For instance, suppose that several standard dwellings were demolished to provide space for a non-residential establishment on a block containing one substandard dwelling. The percentage of substandard dwellings would be increased, but such an increase would be merely a by-product of a separate urban spatial process.

Hartshorn did attempt to consider new construction through his variable NHOS40, which expresses the percentage of housing constructed between 1940 and 1950.[14] He stated that the data for the study variables in general, except for measures of distance and topography, were obtained from Census materials.[15] The 1940 block statistics include an age classification of dwellings, but the 1950 statistics do not. It appears that Hartshorn derived housing constructed between 1940 and 1950 by subtracting the total number of units in 1940 from the 1950 total.

Such a procedure ignores all other processes of change. Were there no demolitions, no conversions, no mergers, no transfers, within the entire study area, during the entire decade? The *Components of Inventory Change* reports of the 1960 Census of Housing, for example, indicate that these processes are significant at the national level. Within all SMSAs it was estimated that 521,262 dwelling units which had existed in 1950 had been converted to form 1,062,421 units in 1959, and 960,743 units had been

---

[10] Hartshorn, op. cit., footnote 1, Figures 11 and 12, p. 93, and Figures 13 and 14, p. 95.

[11] Hartshorn, op. cit., footnote 1, footnote a, Table 1, p. 79.

[12] Hartshorn, op. cit., footnote 1, pp. 76 and 92.

[13] Hartshorn, op. cit., footnote 1, pp. 76, 92, 94, and 95.

[14] Hartshorn, op. cit., footnote 1, Table 1, p. 79.

[15] Hartshorn, op. cit., footnote 1, footnote 39, p. 78.

merged into 462,482 units in the same period. Furthermore, by 1959 an estimated 675,957 units of 1950 had been transferred to non-dwelling unit use or eliminated by processes other than demolition, whereas 496,559 units had been added to the dwelling unit stock by transfer from non-dwelling unit use and by similar processes. During the ten-year period demolition eliminated 1,009,520 units, new construction added 9,827,343 units, and 23,250,588 units existing in 1950 remained numerically unchanged.[16]

Excluding new construction, all these changes had to take place in areas developed at some earlier time. New construction, of course, could also occur in such an area, either on previously vacant land, or as a replacement of demolished buildings. The Cedar Rapids study area, substantially developed as of 1940, is the kind of area in which all these changes might have occurred. A study of qualitative change in the housing stock of such an area should make allowance for quantitative change.

Hartshorn referred to the five stage sequence of neighborhood change postulated by Hoover and Vernon, and equated changes in portions of the study area with the fifth or last stage of the sequence.[17] But if portions of the study area are in stage five, must not other portions be in stage four, or stage three, if not stages two or one? Regarding stage three, Hoover and Vernon stated that:[18]

> It is a down-grading stage, in which old housing (both multifamily and single) is being adapted to greater-density use than it was originally designed for. In this stage there is usually little actual new construction, but there is some population and density growth through conversion and crowding of existing structures.

And regarding stage four, the thinning-out stage, they identified merger and demolition as factors secondary to decline of household size.[19]

The fourth problem involves the comparability of data between censuses. The lack of comparability between 1940 and 1950 data on structural condition is especially serious. These censuses use different terms regarding structural condition, "needing major repairs" in 1940, and "dilapidated" in 1950, which reflect different concepts of structural condition. The 1940 concept related to state of repair, but the 1950 concept was concerned with the adequacy of the structure as a safe shelter.[20] The Census Bureau declared:[21]

> No reliable data have been obtained to compare the relationship between the "major repairs" category and the "dilapidated" category. However, it is the opinion of a number of qualified housing economists that if the two definitions were applied in the same census, the count of "dilapidated" units would be smaller than the count of units "needing major repairs." The two terms differ significantly, and the 1940 and 1950 results on condition are not comparable.

The practical significance of the noncomparability depends on the number of dwelling units which were called substandard solely because of a structural rating. In 1940, for example, of the total number of units which needed major repairs, or lacked a private bath, or both, what percentage had a private bath but needed major repairs? The format of the 1940 block statistics allows us to determine that percentage, which I shall call percent substandard-needing-repairs.

Considering only the substandard units within the 686 study area blocks containing substandard dwelling units in 1940, eighty-four (12.2 percent) of the blocks contained only substandard-needing-repairs units; none of the substandard units on those blocks lacked private bath. An additional eighty-two (12.0 percent) had substandard-needing-repairs percentages of 50.0 and over but less than 100.0. If we consider ten percent substandard-needing-repairs as the minimum level of concern, then 335 (48.8 percent) of the study area blocks containing substandard housing are involved.

Comparison of the 1950 and 1960 housing quality data also involves difficulties, but these are not nearly as severe as the 1940–1950 lack of correspondence. Census experts estimate that, because of the change from a two-class to a three-class condition rating system, the number of "truly dilapidated" units were undercounted by one-third in 1960.[22] The relevance of this

---

[16] Bureau of the Census, U.S. Census of Housing: 1960, Volume IV, Components of Inventory Change, Final Report HC(4), Part 1A, No. 1, United States and Regions (Washington: Government Printing Office, 1962), Table 2, p. 38, Table 3, p. 48, and Table 5, p. 57.

[17] Hartshorn, op. cit., footnote 1, p. 95.

[18] Edgar M. Hoover and Raymond Vernon, Anatomy of a Metropolis (Cambridge: Harvard University Press, 1959), p. 196.

[19] Hoover and Vernon, op. cit., footnote 18, p. 199.

[20] Bureau of the Census, op. cit., footnote 7, p. 1.

[21] Bureau of the Census, U.S. Census of Housing: 1950, Volume I, General Characteristics, Part 1, U.S. Summary (Washington: Government Printing Office, 1953), p. xix.

[22] Bureau of the Census, op. cit., footnote 7, pp. 1 and 5.

undercount to Hartshorn's analysis depends upon its impact on the count of substandard units. Of those dwelling units which erroneously were not classified as dilapidated in 1960, what percentage lacked private plumbing facilities, and therefore would have been called substandard anyway, and what percentage had such facilities, and therefore would have been called standard?

In Cedar Rapids in 1950, 19.6 percent of total units classified as dilapidated, and 20.4 percent of occupied units classified as dilapidated, had all plumbing facilities.[23] Nationally, within all SMSAs, the 1950 percentage for occupied dilapidated units was 29.2.[24] By 1960, within all SMSAs the percentage of occupied units classified as dilapidated and having all facilities was 47.1.[25] If Cedar Rapids followed the national trend, in 1960 roughly sixty-five percent of its occupied "truly dilapidated" units would have been classified dilapidated, and another twenty to twenty-five percent would have been classified as sound and lacking facilities or deteriorating and lacking facilities. The remaining ten-plus percent would have been classified as sound with all facilities or deteriorating with all facilities, and therefore not substandard. Hartshorn should at least have mentioned this possible ten percent undercount. Furthermore, the block statistics format for recording plumbing facilities was changed between 1950 and 1960. In 1950 units were listed if they lacked private bath, but in 1960 units were listed if they lacked private bath, or private flush toilet, or hot running water.[26] This change was negligible in Cedar Rapids, but it might be of importance in some parts of the country.

The fifth problem is that Census data on dilapidation and substandardness at the city block level are unreliable and inaccurate even within individual censal years.[27] These deficiencies have been known for many years. A

Post-enumeration Survey was conducted by the Census Bureau in conjunction with the 1950 Census of Housing.[28] Two enumerators rated the same urban occupied dwellings. Of every hundred dwellings classified dilapidated by the 1950 Census, the second enumerator classified twenty-five not dilapidated with all facilities, forty-three as not dilapidated but lacking facilities, and only thirty-two as dilapidated. Of every hundred units classified by the 1950 Census as not dilapidated but lacking facilities, the second enumerator classified eight as not dilapidated with all facilities, and twelve as dilapidated.

Much more detail on 1950 and 1960 census data deficiencies has been revealed in the 1967 Census Bureau working paper appraising census statistics and methods relating to housing quality.[29] As an example of the general unreliability of the 1960 Census dilapidation data, if the Census had been taken a second time under identical conditions,[30]

> of the 2.9 million units classified as dilapidated the first time, no more than 1.1 million would have been classified the same way the second time. A corresponding number of units classified as not dilapidated the first time would have been classified as dilapidated the second.

Although the 1960 census tract data on dilapidation give a valid ordering or ranking within individual cities, "block statistics are of very poor quality as far as comparability is concerned."[31] The unreliability of the data on dilapidation makes the block statistics on substandard housing insufficiently reliable. The working paper concluded that:[32]

> The ordering of blocks is more accurate on the portion substandard than on the portion dilapidated, but probably not accurate enough.

Data on substandard housing in the 1950 Census are equally suspect:[33]

> had methods of eliminating between-enumerator variation been developed, the results which would have been obtained from a 10- to 15-percent sample would have been as accurate as those that were obtained

[23] Bureau of the Census, *U.S. Census of Housing: 1950*, Vol. I, *General Characteristics*, Part 3, Idaho–Massachusetts (Washington: Government Printing Office, 1953), Table 18, p. 15–20.

[24] Bureau of the Census, op. cit., footnote 21, Table 23, p. 1–48.

[25] Bureau of the Census, op. cit., footnote 7, Table B-1, p. 65.

[26] Bureau of the Census, *Census of Housing: 1960*, Vol. III, *City Blocks*, Series HC(3), No. 158, Cedar Rapids, Iowa (Washington: Government Printing Office, 1961), p. x.

[27] Bureau of the Census, op. cit., footnote 7, p. 5.

[28] Beverly Duncan and Philip M. Hauser, *Housing a Metropolis: Chicago* (Glencoe, Illinois: The Free Press of Glencoe, 1960), pp. 68–70.

[29] Bureau of the Census, op. cit., footnote 7.

[30] Bureau of the Census, op. cit., footnote 7, p. 11.

[31] Bureau of the Census, op. cit., footnote 7, p. 11.

[32] Bureau of the Census, op. cit., footnote 7, p. 12.

[33] Bureau of the Census, op. cit., footnote 7, p. 18.

from the actual 100-percent enumeration of 1950 for areas ranging in size from an enumeration district to the United States as a whole. This implies a level of accuracy for blocks of average size or less, i.e., with no more than 30 to 40 housing units, that is not adequate for most purposes.

In 1950, of the 578 Cedar Rapids study area blocks containing substandard units, 431 blocks (73.7 percent) had thirty or fewer dwelling units; an additional sixty-one blocks (10.4 percent) were in the marginal range of thirty-one to forty dwelling units.[34]

In summary, Hartshorn's article does not adequately define the terms used regarding housing quality. It lacks a clear statement of the meaning and content of the Census housing quality data. It neglects the potential impact on housing quality percentages and ratios of the various processes of quantitative change in the housing stock. It compares data which, because of basic conceptual differences, are not comparable. It analyzes at city block scale housing quality data which are not sufficiently reliable or accurate at that scale. Because of these deficiencies, Hartshorn's conclusions are subject to serious question, if not outright rejection.

Much of this difficulty could have been avoided by the use of census tract data. The block data correlations Hartshorn found between upward or downward movements of housing quality and certain "socioeconomic" housing characteristics are actually not very revealing or useful.[35] The urban geographer or planner needs to know the degree of relationship between changes in socioeconomic characteristics and changes in housing quality. Census tract data

on housing quality, at least for 1950 and 1960, allow a dependable ranking of tracts in a best to worst condition sequence. And census tracts have the detailed population and housing characteristics data which Hartshorn found lacking in the block statistics. Census tracts would have allowed the choice of a larger central city, with a more typical population mix. Since most of the sources used in the study were published Census Bureau reports, the amount of analysis time required would not necessarily have been increased.

But what is most disappointing in Hartshorn's article is his failure even to mention the very serious problems within the housing quality data. He must have been aware of these problems, because he cited the Census Bureau working paper as one of several general discussions of the use of census data on housing quality.[36] He mentioned data deficiencies at several points, but his only specific references are to social and economic data.[37] The readers of his article, and all potential users of housing quality data in the censuses, are entitled to a warning about the serious flaws in these data.

EDWARD LIMOGES

Mr. Limoges is a doctoral student in geography at the University of Michigan in Ann Arbor.

EDITOR'S NOTE

ALTHOUGH he shares Mr. Limoges' concern with census block data, Professor Hartshorn chose not to reply to these comments, because he has already attempted to clarify his procedure on pages 139–42 of the March 1972 issue of the *Annals*.

---

[34] Bureau of the Census, *U.S. Census of Housing: 1950*, Vol. V, *Block Statistics*, Part 29, Cedar Rapids, Iowa (Washington: Government Printing Office, 1952), Table 3, pp. 4–15.

[35] Hartshorn, op. cit., footnote 1, pp. 88, 91–95.

---

[36] Hartshorn, op. cit., footnote 1, footnote 40, pp. 78 and 79.

[37] Hartshorn, op. cit., pp. 78, 87, 95, and 96.