

THE COMPARATIVE ATLAS OF AMERICA'S TWENTY
LARGEST METROPOLITAN REGIONS

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The Comparative Atlas of America's twenty largest metropolitan regions will summarize the insights of the Comparative Metropolitan Atlas Project of the Association of American Geographers. 1/ The Project's overriding objective was to provide an accurate comparative assessment of the progress being made toward meeting basic human needs in America's largest cities. Research focused especially on variations in the occurrence and intensity of problems among the twenty places. Given these purposes, designing the Atlas raised questions concerning: 1) which cities to map, 2) what topics to map, 3) map scales and cartographic techniques, and 4) the organization of the Atlas. The normal production processes of data gathering, compilation, editing, scribing, and proofing were also governed by the objectives of the Atlas and by the technology available to achieve its cartographic goals.

DESIGN

Intended Audience--The Comparative Atlas will provide Federal, State, and local officials with a useful tool for comparing similarities and differences among the cities mapped. The basic processes of urbanization and metropolitan evolution are common to all cities, but regional and temporal variations among American cities have caused urban processes to work themselves out in different ways, producing cities as dissimilar as Baltimore and Los Angeles within the same nation. No city's problems are exactly the same as any other city's. At the same time neither are they wholly dissimilar. The same principle holds regarding workable solutions for urban problems. Whereas the policies that would solve Washington, D.C.'s housing problems have elements in common with those that would work in Minneapolis-St. Paul, they must also take on local character that is responsive to the individuality of the Minneapolis-St. Paul region. Programs and policies that fail to recognize and accommodate the individuality and the underlying similarities among the Nation's metropolitan regions will certainly fail to yield maximum benefits.

The notion of putting maps of the same variables for different places together and examining them may sound rudimentary, but with one unsatisfactory exception, 2/ it has not heretofore been done for American cities. Combining maps of different variables in the same city with maps of the same variable for different cities in the same volume will help politicians, bureaucrats, and scholars make the comparisons among places that are prerequisite to formulating intelligent policies that respond effectively to America's metropolitan problems.

City Selection--The twenty largest metropolitan systems were selected for mapping in the Atlas after other alternatives were rejected. The Project's directors and steering committee weighed the advantages of choosing a stratified sample of urban places of different sizes versus the benefits of analyzing a manageable number of the largest metropolitan regions. They found it impossible to establish clear and consistent criteria for a stratified sample, and were simultaneously impressed with the aggregate size and economic importance of the twenty largest places (Figure 1). In 1970, 81 million people, or 40 percent of the Nation's population, lived within the Daily Urban Systems (commuting hinterlands) of the twenty largest places. The twenty commuting regions mapped in Figure 1 contain 24 standard metropolitan statistical areas, with an aggregate 1970 population of 68 million people, or 61 percent of the Nation's 1970 metropolitan population. Economic activities are equally or even more concentrated in these places, which are small in area but which loom large in the Nation's daily affairs. In 1967, for example, almost 60 percent of the Nation's wholesale trade was conducted within the twenty regions, and in 1970, 370 (75 percent) of the top 500, and 81 of the largest 100 industrial corporations in the Nation were headquartered in one of the twenty largest regions. The proportion of the Nation's metropolitan population living in the twenty places and the share of the Nation's productive capacity that is controlled from the twenty places made it quite clear that focusing on the twenty largest metropolitan regions would yield greater benefits than the alternatives.

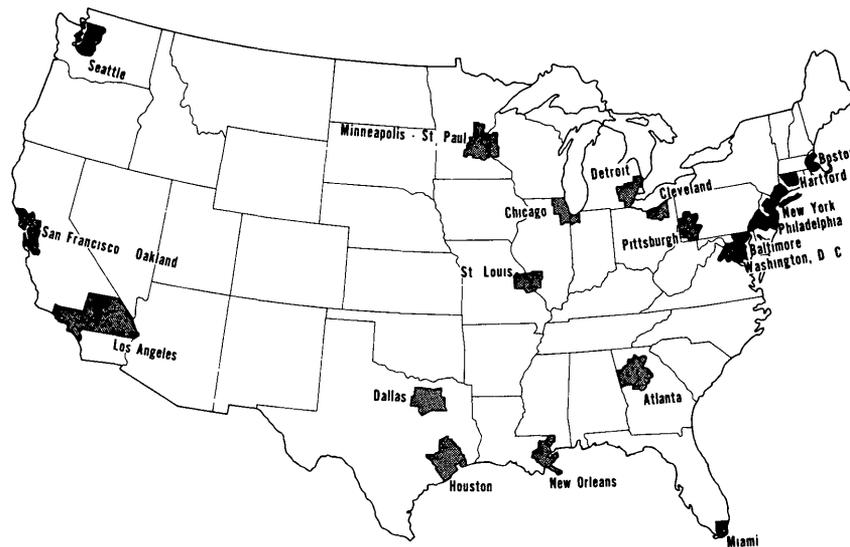


Figure 1: America's twenty largest Daily Urban Systems. Each Daily Urban System consists of one or more standard metropolitan statistical areas and the surrounding counties that have 5 percent or more of their labor force working in its employment.

Variables--Selecting topics to map was more complicated than choosing the cities. Making it possible for Atlas users to compare geographical patterns among the twenty cities dictated almost exclusively reliance on statistics from the 1970 Censuses of Housing and Population. The numerous data developed by local and State agencies usually differ in definition, scope, and format to the degree that they cannot be used for direct comparisons among places. Indeed, our few attempts to use data from local sources were only partially successful because of such problems. Census data

do have many limitations of their own, but their outstanding value for our purposes was that they are produced by identical inquiries made in a uniform manner throughout the Nation.

Tens of thousands of cross-tabulations are available on the Fourth Count Census Tapes that were our major data source. We selected 44 standard variables for mapping in the Atlas based on: 1) the degree to which they were commonly accepted indicators of socioeconomic conditions, and 2) the extent to which they would measure the progress being made toward providing human needs in American cities. Because of the biases inherent in the census, the Atlas is perhaps overrich in some topics and inadequate in others. It contains many maps of basic demographic characteristics, housing conditions, employment, and income variables. On the other hand, it is deficient in standard series on topics such as the physical environment and environment degradation, health care and disease, recreational resources and activities, and crime.

Most of the Atlas maps are based on tract level data, with a few map series based on minor civil division statistics. For most purposes, block data would have provided too much detail and summaries for units larger than tracts did not provide enough detail for our purposes.

Scales and Cartographic Techniques--Proper selection of scales and retention of the same scales throughout the Atlas were especially important because of the comparative uses foreseen for the Atlas. Valid comparisons among places require common scales throughout. The large size of the central city of Chicago and the small size of Washington, D.C., for example, are basic elements of the geography of both cities that would be obscured if both central cities were not mapped at the same scale. Metropolitan regions and their components are therefore mapped at three scales. Topics mapped for the Daily Urban Systems will appear at a scale of 1:2 000 000. Standard metropolitan statistical areas have been mapped at 1:1 000,000, and each central city will be mapped at 1:250 000. These scales will be maintained for all cities, regardless of size. At these scales, the largest maps fit within the Atlas's 13 x 11 inch trim size.

A scale and its corresponding region was chosen for each variable in accordance with the portions of the metropolitan system in which values of interest occurred. Predominantly black neighborhoods, for example, are conspicuous for their concentration in central cities and for their absence in suburban and urban fringe areas. Thus, mapping black population at the DUS or SMSA scale, while it might be a good way to illustrate where blacks aren't, produces few insights beyond those evident on a central city map. Problems caused by onsite sewage disposal, on the other hand, are serious in suburban and urban fringe areas whereas they are usually negligible in central cities.

Maps presented at any of the selected scales will necessarily be highly generalized. It is our intention to present the basic patterns rather than the fine details of the topics mapped, and the readers for whom the Atlas is intended are in most cases not skilled map readers. We therefore converted absolute values to percentages whenever possible, and smoothed individual tract values by portraying them as a statistical surface. Most maps are shaded isopleth maps. Interpolation was generally linear, but strict linear interpolation was modified often enough to make some parts of many maps quasiasymmetric. This usually occurs where linear interpolation of extreme values for small areas might give an erroneous impression, as in the case of the effect a home for the elderly that occupies an entire census tract would have on a map of median age. Most isopleth maps are accompanied by a small histogram that makes it possible for Atlas users to see the statistical shape of the geographical pattern they are examining.

Dot distribution maps are used for items that occur erratically or in small numbers. Percentage maps for ethnic groups or abandoned houses, for example, would be low and would vary widely from tract to tract; dot maps provide more accurate impressions of such distributions.

The Atlas will be printed in two colors, black and orange. We had hoped to print in four colors, but the costs of doing so became prohibitive. Base information and isopleths will print solid black and the shading between isopleths will be different values of the orange hue selected. Water bodies will be shown with a light black screen. Because of the emphasis on comparing general patterns from place to place, base information is minimal; only major highways, water bodies, and political boundaries appear as location cues.

Atlas Organization--We foresee that some Atlas users will be interested in specific cities and the full array of their interacting problems and processes, whereas others will be more concerned with individual problems and differences in their occurrence and intensity from place to place. Thus the 1,050 maps in the Atlas proper are arranged in a way that facilitates the study of individual cities as well as comparisons among them. The first half of the Atlas will consist of one chapter for each of the twenty cities. Within each city's chapter an opening series of maps describing topography, land use, and housing characteristics is to be followed by a second section that concentrates on population density, age-sex structure, and racial and ethnic characteristics. A third part of each city's chapter will deal with social topics, occupations, and income, and the concluding section will contain six maps that highlight special problems in that city. Most maps in each city's chapter will be at the SMSA (1:1 000 000) scale, although central city and DUS maps will be used when necessary.

The second half of the Atlas is organized topically. Each chapter will consist of one map of the same variable in each of the twenty cities included in the study. Topics roughly parallel those mapped in the city chapters. Three items on the physical environment are followed by a larger number comparing housing, transportation, and land use patterns among the twenty regions. Education and health care are also briefly examined. A set of maps on minority segregation, employment, and poverty follows, and the Atlas will conclude with an essay on public policy requisites for American metropolitan areas. The twenty chapters on individual cities are to be preceded by five chapters that introduce the reader to the national metropolitan network, data sources, and Atlas cartographic conventions. The concluding essay on policy requisites will be followed by an appendix on cartographic methods and data reliability.

The Atlas will contain, in addition to the maps and their accompanying histograms, an extensive commentary that places individual maps in the broader context of the regional and national dimensions of the problem under discussion. The commentary averages about 150 words per map, or almost 200,000 words when introductory material and appendices are included.

PRODUCTION

Compilation--Variables selected for mapping were extracted from DUALabs tapes and converted to hard copy by the Institute of Urban and Regional Research at the University of Iowa. Clerical employees of the Cartographic Laboratory at the University of Minnesota, where the Atlas was produced, then transferred the data to

base maps. The Atlas uses 60 base maps, one for each of the three scales for each of the twenty cities. Data compilation bases were derived from the metropolitan area tract maps that accompany the PC(1) printed tract reports and from the State minor civil division maps published by the census. In addition, 60 separate political boundary bases and another 60 overlays showing water features and major highways were prepared. All bases were first drafted at four times final production scale, and all data compilation and interpolation was performed at the same scale. The histograms were compiled and drafted at five times production scale.

Isopleth and dot distribution overlays were interpolated by the chief cartographer and his assistants. Standard isopleth values and standard dot values were used throughout because of the comparative nature of the Atlas. For most topics mapped with shaded isopleths, the extreme values are of greatest interest, and since such topics have been mapped in percentages, (for example, percentage Negro), isopleths were interpolated at 10, 30, 70, and 90 percent. Dot values of one dot for 50 people on ethnic group maps and one dot for 10 dwelling units on housing condition maps were established after some experimentation. Standardized data intervals of this kind are less than optimal for most individual city maps, but using different class intervals for different cities, however much it might be justified locally, would destroy the comparative value of the work. The judgement that most potential readers would be unskilled at reading thematic maps led us to adopt the standard 10, 30, 70, 90 percent breakdown for all maps that could be presented in percentage terms.

The Atlas editor generalized each data map, suppressing erratic and isolated values that complicated general patterns. A dummy of the Atlas had been prepared that grouped related topics on the same page or on facing pages in the individual city chapters, and that grouped cities with similar growth histories on the same or facing pages in the topical section. The edited overlays were photographically reduced to final production size and arranged for scribing according to the layout established in the dummy.

Scribing and Color Separation--Atlas pages were scribed as single units, with the number of maps and histograms on a given page varying between one and six of each. Isopleths were scribed on one overlay, and the photographically reduced histograms were then stripped into the same overlay. The political boundary and location cue bases had also been photographically reduced, and they were scribed also. Because the political boundaries and location cues for a given city at a given scale were invariant from map to map, page negatives for those features were composed photographically from a single scribed version at a considerable saving in cartographic time.

Color separations were produced by the triple exposure of photosensitive strippable film through the isopleth/histogram, political boundary, and location cue overlays. Five color separation negatives were made for the five orange values (10, 20, 40, 60 and 100 percent), and one separation negative was made for water features (20 percent black). A separate positive lettering overlay was prepared using stick-up typography, from which a contact negative was then produced.

The negative for the 100 percent black areas was compiled by multiple contact exposure of the lettering negative, the scribed data/histogram film, the political boundary negative, and the location cue negative to duplicating film. The normal products delivered to the printer will thus consist of seven negatives, five for exposure on the orange plate and two for exposure on the black plate. Pages containing one or more dot maps are to be produced in much the same way, except that a separate dot negative has been prepared for direct exposure onto the appropriate

plate. Pages with isopleth maps and dot maps in both colors thus require nine exposures on the two plates, whereas pages with black dots only and no isopleth maps will require but three exposures. Figure 2 summarizes the production scheme.

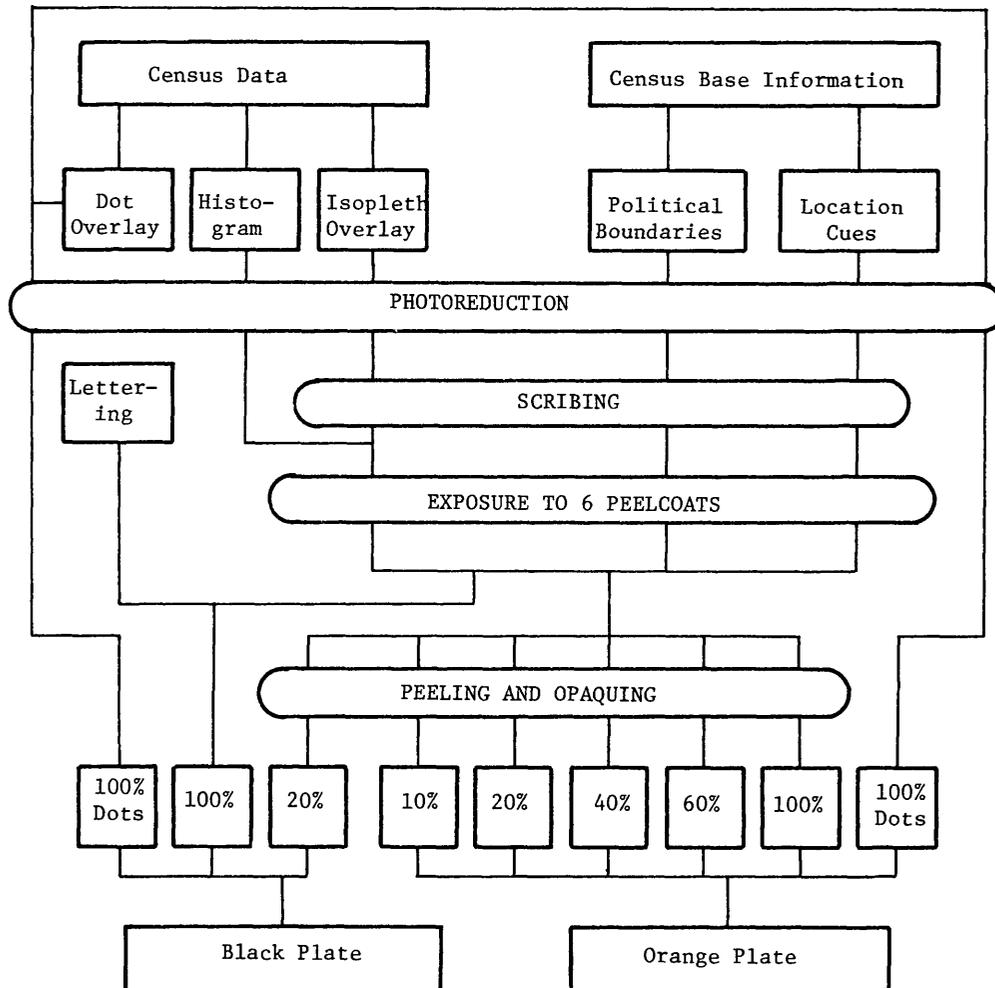


Figure 2: Production Scheme

The printer will prepare color proofs for each page to provide a final check for errors before the plates are exposed. All scribing materials photographic films, and strippable films used in production are 0.0075 inches thick, and pin registration was used at all stages after photoreduction of the overlays. Thus the negatives supplied to the printer should be in almost perfect register.

The Atlas will contain over 1,800 maps and graphs, all of which were compiled, interpolated, and scribed by hand. Many production economies were realized because only the data overlays and histograms varied over the 60 standard bases. Thus although the comparative nature of the work imposed certain constraints on layout and symbolization, such limitations were offset by the benefits of frequent repetition of bases and standardization of symbols. Computer cartography was much more in its infancy in 1970 and 1971 when the Atlas was conceived than it is today. Given the relatively primitive state of the art then, the decision to perform all compilation, interpolation, and production by hand was appropriate. Were the same project

being conceived now, more intensive use of computer technology would doubtless be incorporated.

REFERENCES

1. Abler, Ronald, editor. A Comparative Atlas of America's Great Cities: Twenty Metropolitan Regions. Minneapolis: University of Minnesota Press and the Association of American Geographers, 1976. The Comparative Atlas will be Volume III of the publications of the Comparative Metropolitan Analysis Project. Other publications are Urban Policymaking and Metropolitan Dynamics: A Comparative Geographical Analysis (Volume I), and Contemporary Metropolitan America: Twenty Geographical Vignettes (Volume II). Both were edited by John S. Adams and both will be published in 1976 by Ballinger Press, Cambridge, Massachusetts. The Comparative Metropolitan Analysis Project was funded by a grant from the National Science Foundation to the Association of American Geographers. The Project was supervised by a steering committee consisting of Brian J. L. Berry, University of Chicago, Chairman; John R. Borchert, University of Minnesota; Frank E. Horton, University of Iowa; James E. Vance, University of California, Berkeley; David Ward, University of Wisconsin; and J. Warren Nystrom, Executive Director, Association of American Geographers. John S. Adams, University of Minnesota, was research director for the Project. Mr. Abler was associate director and Atlas editor. Mr. Ki-Suk Lee, Seoul National University, was chief cartographer for the entire project as well as for the Atlas.
2. Passoneau, Joseph R. and Wurman, Richard Saul. Urban Atlas: 20 American Cities: A Communication Study Notating Selected Urban Data At a Scale of 1:48,000, Cambridge: M. I. T. Press, 1967.