

COVERAGE OF (NOT IN) EMERGENCY SHELTERS IN S-NIGHT 1990

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The Census Bureau conducted a special 1990 operation to include in the census persons found in shelters and other locations used by homeless people. This Shelter and Street operation, known as S-Night, was conducted at pre-identified emergency shelters from 6 p.m. to midnight on March 20 and at other locations the next morning. In conjunction with the S-Night count, the Census Bureau designed research to assess the completeness of the Bureau's shelter lists.² This assessment is one of the first to attempt to measure the coverage of a Census group quarters list.

In this paper, we use a dual systems model to estimate the shelter coverage in the 1990 Census. We describe the assessment study and the extent to which the assumptions of the dual systems estimation model are met with our data, using information from local expert reports, a district office specialist survey, and telephone followup. We present the coverage results, discuss their significance, and identify definitional and methodological issues raised by this research.

The Shelter List Assessment Study Design

The Census Bureau's list of S-Night places was compiled from selected administrative shelter lists, lists solicited from local jurisdictions, and activities in the District Offices (U.S. Department of Commerce, 1989c).

A stratified sample of 45 District Offices (DOs), 10% of the total, was drawn by the Census Bureau's Decennial Statistical Studies Division (Moriarty, February, 1990). An outside homeless expert, William Friskics-Warren, was commissioned to locate and hire local homeless experts in each of the 45 DO areas. Each local expert was sent the Census Bureau criteria for shelters³ and a DO area map and asked to compile an independent shelter list for that area. The outside experts submitted these lists to Mr. Friskics-Warren⁴ and their local DO.

The DO Special Place Operations Supervisor (SPOS) went through the expert list classifying the entries as "in scope" or "not in-scope for S-Night". They then determined whether each in-scope S-Night shelter was already on the S-Night list. New places on the local expert list were contacted, and if found to meet census shelter criteria, were added to the shelter list and enumerated.

After comparing the lists, the SPOS in each DO forwarded the annotated expert list and copies of all pre-processed individual shelter Enumeration Record Forms (D-117s) directly to headquarters, where we checked them and followed up any unresolved places on the expert lists by phone with the SPOSs. This data collection phase took place during the spring and summer of 1990.

Difficulties in Realization of the Design

While the mathematical theory underlying dual systems estimation is deceptively simple and therefore attractive, the literature offers warnings about difficulties in actually

achieving the conditions the design seeks to assure. (Marks, Seltzer, Krotki, 1974, Krotki, 1978) The Shelter List Assessment Study was not immune to these problems. They have profound effects on the quality of the assessment and the universe to which inference can be made. In this section we describe some of the difficulties encountered and their impact on the study.

What is a Shelter?

In matching the local expert shelter lists and DO shelter enumeration forms there was not always a one-to-one correspondence between the entities on the two. In a number of cases the local expert identified a shelter and one address, that is, a special place, while the Census Bureau listed the same place name several times with the same or different addresses, each as a separate group quarter with its own count of people. Should this be taken as a single shelter or as several shelters? This issue is irrelevant if we want just the population count, but when shelters themselves are of interest, or when seeking the number of "shelters" appearing on each of two lists, this ambiguity is unacceptable. For our present purposes, the "special place" is a more appropriate unit of analysis than the "group quarter" location where homeless people are found." We have attempted to recreate these "special places."

Using shelter names, addresses, and enumerator notes on the Census Bureau forms, we have "bundled" associated group quarters locations into special places. We use the term "shelter" to refer to these bundled group quarters locations as well as to single "group quarters locations where homeless people are found" which were not part of a larger entity.

In several instances we encountered group quarters with the same name, often in the same building, but with different functions. For example, some large shelters house drug detoxification programs and general homeless shelter programs, classified by the Census Bureau as different types of group quarters, counted during separate census operations. Nonetheless, some detoxification wings or floors were enumerated as S-Night shelters. When there was clear evidence that the group quarter was used for drug detoxification or some other non-S-Night function, we have omitted it from this study.

However, when we encountered wings, floors or dormitories at one address treated as distinct group quarters with separate counts simply on the basis of gender, presence of children, or employment status, we bundled such locations together as single "special places." We did not think they had separate functions.

Using these rules, we bundled 188 of the total number of in-scope S-Night group quarters into 51 special places. We estimate that there are 10,695 (\pm 709) S-Night locations in the final Census records and that number would be reduced to 9,624 (\pm 588) using these rules.⁵ The ratio of the number of "shelters" to the number of S-Night group quarters is .90 (\pm .06)⁶

Shelters for Juveniles

There is a clear disparity between the definition of "shelter" provided to local experts and the definition used in the Census Special Place Pelist manual. The phrase "emergency shelters or group homes providing temporary sleeping facilities for juveniles" was left out of the written instructions to local experts and not mentioned in the Census Bureau letter soliciting shelter lists from local jurisdictions.⁷ These facilities are about twice as common on the Census list as on the Local Expert Lists (8.3 and 3.5 percent, respectively). For this analysis, we have excluded juvenile shelters.

Post S-Night Data Metamorphoses

In 1991 we obtained the final official census list of S-Night shelters and their population counts for the sample DOs. It differs from the early lists obtained from the DOs: Eighty-six locations judged in-scope in summer, 1990 did not appear on the final S-Night list, while 52 places considered out-of-scope in the early period did appear in the final official shelter list. In addition, 208 locations not identified to us in 1990 did appear on the final list. These additions and omissions from the S-Night shelter list represent the result of many processes and reviews to which the Census' S-Night shelter list was subjected.⁸

The dual systems estimate of the Census capture rate depends on the numbers of shelters found by the local experts and the number found by both the local experts and the Census. Additions to the census list alone thus do not affect the estimated capture rate, though they obviously do affect what it estimates! Unlike places on the original Census list or those added to it from the local expert list, those places only on the local expert list and judged out-of-scope as S-Night shelters by the DO SPOS were dropped from further consideration and thus had only a minute chance of being reevaluated as S-Night shelters. Table 1 shows this population size is not trivial. Sixty-five percent of the shelters identified by local experts in these 45 DOs were judged out of scope for S-Night. About one-third (272) of these fell into other group quarters types or were classified as housing units, eligible for enumeration in other Census operations. It was unlikely they could have been reconsidered and perhaps returned to the S-Night shelter list.

These disparities force us to base our Census capture rate assessment on the situation in the Summer of 1990, when the original assessment data were gathered from the sample DOs, and somewhat distance the relevance of our results from the final 1990 Census.

The "Independence" of Local Experts

A critical assumption of the dual systems Census capture rate estimate is that the probability that a shelter will be listed by the Census is not affected by whether or not it was listed by the local expert (and vice versa). The local experts were directed to compile independent shelter lists, without specification of the meaning or operationalization of "independent."⁹ From the local expert reports and phone interviews, we found that statistical independence was not uniformly achieved. In twelve districts the local expert played some role in the compilation of the Census list. In five of these the expert sent the same shelter list to both the Census and to Mr. Friskics-Warren and in seven others, the local expert

revised an early list originally sent to the Bureau to submit to Mr. Friskics-Warren. In the remaining 33 districts, the expert was independent, that is, had no involvement in the Census compilation of its S-Night shelter list.¹⁰ We limit our analysis to these "independent" districts. We treat the 12 lists as non-respondents, and inflate the stratum weights.

Other sample adjustments

Three additional districts, all with independent experts, require our attention because the expert lists contained no in-scope shelters. In one, neither the expert nor the Census listed any shelters; we treat this district as not a member of the universe of districts with shelters, and reduce the sample size and universe size in its stratum.¹¹ A second expert returned a list of 24 shelters, none within his assigned area. We treat this as a non-response, and inflate the weights of the other DOs in the stratum. A third expert returned a list of 42 shelters, none of them judged to be an in-scope S-Night shelter. While there is nothing wrong with a list with no in-scope shelters, the dual systems estimate is undefined, and we treat this as another non-response.

We pay a rather heavy price for these lapses in design realization: 33% "non-response" in the probability sample and 17% in the certainty stratum. Five DOs remain in each of the six strata. Treating these sample adjustments as "nonresponse" entails the assumption that the excluded DOs are adequately represented by those remaining, admittedly a leap of faith largely driven by desperation -- but no alternative is available. In addition, we are forced to restrict our inferences away from the 1990 Census results because finalization of the Census involved operations which occurred after the measurements analyzed here.

Estimates of Capture Rates for Census Shelter Lists

We have paid this heavy price in 'non-response' to retain the relevance of the very simple dual systems model. If the Census and Expert lists are independent then the fraction of the shelters on the experts' lists which are also found on the Census' list estimates the probability that any shelter will be listed or "captured" by the Census. We allow the census and expert "systems" to have different capture rates and recognize that each might have a different capture rate in each DO.¹² This is the situation modelled by the dual systems or "Petersen" estimator. (Volter, 1986) In addition, we allow different shelters to have different probabilities of capture by the same system within a district, in a way we can empirically deal with, by post-stratifying our estimate by shelter size. Larger shelters ought to be easier to find than smaller ones. Post hoc, we have measurements of the shelter sizes -- the population in them.¹³ We divide the size distribution of shelters into five groups of roughly equal numbers of shelters and estimate capture rates within these size classes.

Table 2 provides dual systems estimates of the Census capture rate of shelters by shelter size. For the i^{th} DO in sample stratum j , the data consist of the number of shelters of size k listed by the census operation (C_{ijk}), by the local experts (E_{ijk}), and by both (B_{ijk}). The total number of shelters listed is $C_{ijk} + E_{ijk} - B_{ijk}$. The bottom panel of the table shows the data for each stratum by shelter size class. Recall that each stratum contains five DOs. Caution is warranted due to the magnitudes upon which the estimates rest. There aren't a lot of shelters and a large fraction of them come from a single stratum (IIa).

The dual systems estimator of the census capture rate for shelters of size k in stratum j is

$$cR_{jk} = \sum_i B_{ij} / \sum_i E_{ijk}$$

(Because this is within strata, the sampling weights are irrelevant.) The standard errors shown are estimated by jackknife replications.¹⁴ The certainty strata are treated as immune to sampling variation, and thus no sampling errors are shown for them. We can gain some insight into the behavior of the dual systems estimator. In stratum IV Districts the local experts found no empty shelters, so the \bar{r}_{at} is not defined. Elsewhere, (not visible in this table) there is at least one District in which the census found, say, five or six shelters and the local expert found only one or two, none of which was on the census list. This results in a dual systems census capture rate of zero, in apparent denial of the number found.

The upper panel of Table 2 provides dual systems estimates of the Census capture rate of emergency shelters by shelter size. The point estimates are weighted up from the within stratum estimates shown (including the certainty strata) using the adjusted sampling weights. The standard errors are obtained by stratified jackknife replication, excluding the certainty strata. It is immediately clear that, as of the Summer of 1990, the Census capture rate for empty shelters was below 80%. The estimate of 47% is clearly below the capture rate for shelters with one or more occupants.¹⁵ This sample of DOs allows us to discuss the difference between capture rates for empty and non-empty shelters, but does not permit us to infer any monotonic relation between a shelter's size and its probability of Census capture.

The low Census capture rate for shelters of size zero does not impugn the quality of Census counts of people in shelters. It should, however, offer caution to those who would employ Census data to make inferences about the nature or extent of resources providing emergency housing. About half of these empty shelters are hotels or motels, as are about half of all shelters. From the names, some of the others seem to be shelters, perhaps with many beds; others appear to be church organizations, perhaps with one or two beds. Lacking any means of determining why they were empty on S-Night, and assuming there was no way for census operations to determine before visiting whether shelters were empty on the reference date, we can only recommend canvassing all places that might harbor people and point out our inability to assess the efficiency of such an operation from the data in hand.¹⁶ It is instructive that the dual systems estimate of the shelter size distribution has one third of all shelters empty. If we assume that the shelters empty on S-Night could provide housing for more than one or two persons, they cannot safely be ignored either in enumerating persons or in discussing the emergency housing resource base.

Table 2 also compares estimates of the Census capture rate for all and for non-empty shelters. Somewhere between 95 and 99 percent of non-empty shelters were listed; we did well but can still do better. The Bureau probably added shelters to the lists represented here, increasing shelter coverage, but our data do not permit estimates of that improvement.

In conclusion, we have described the S-Night assessment methodology and our experiences using the dual systems model. We have discussed difficulties

encountered in applying the dual systems model in terms of the definition of a shelter, the omission of juvenile shelters, post-S-Night data changes, the independence of local experts, and situations where local expert lists contained no in-scope shelters. These problems caused us headaches and limited our inferences about the shelter phase of S-Night, but were useful in helping us reevaluate the S-Night methodology and reporting system from new perspectives.

Sometime back one of us wrote expressing unreserved confidence in the count of persons in emergency shelters in the 1990 Census (Taeuber and Siegel, 1991). The contorted title of this paper is an attempt to clearly insulate our inferences on coverage of shelters from the issue of coverage in shelters. The contortions we have gone through in dealing with what we call 'non-response' prevent us from making straightforward inference to the shelters in the official 1990 Census data. Nevertheless, the results suggest very strongly that the 1990 Census identified non-empty shelters quite well.

We feel the dual systems model holds promise for assessing the coverage of other group quarters. Based on this experience, we can design better assessment studies for the proposed 1994 Federal Survey of Homeless Persons who Use Service Facilities as well as other censuses and surveys.

Notes

1. The authors' names are in alphabetical order. We wish to acknowledge the comments and assistance from Annetta Clark, Howard Hogan, Timothy Madigan, Chris Moriarity, Paula Schneider, and Henry Woltman. The views in this paper are those of the authors and do not represent official Census Bureau findings or conclusions.
2. The Bureau also designed a five-city assessment of the street phase of S-Night. For information on these assessments, see Cousineau 1990, Edin 1990, Hopper 1991a and 1991b, Stark 1991, and Wright and Devine 1990. A summary report of the five cities is presented in Martin 1992.
3. Shelters for the homeless with sleeping facilities include: a) emergency housing, missions and flophouses, Salvation Army shelters, b) hotels and motels charging \$12 or less per night (excluding taxes), c) hotels and motels costing more than \$12 per night used entirely for homeless persons, d) the group of rooms in hotels and motels costing more than \$12 per night used partially for the homeless, e) similar places with sleeping facilities known to have persons with no usual home elsewhere (UHE) who stay overnight, (and f) emergency shelters/group homes which provide temporary sleeping facilities for juveniles.] (U.S. Department of Commerce March 1989a). The phrase in brackets was inadvertently omitted from Mr. Friskics-Warren's instructions to local experts. Shelters for abused women were enumerated on S-Night, but tallied separately and not included in this analysis.
4. For a discussion of the methodology used to locate and hire outside homeless experts, as well as a preliminary evaluation of the lists and recommendations for compiling future lists, see Friskics-Warren 1991.
5. The half-width of the 90 percent confidence interval is given in parentheses. In this instance the data are based on all records in the Census final file from the full sample of 45 DOs.
6. The variance of the ratio of the number of shelters (S) to the number of group quarters locations (G) is estimated as
$$\text{Var}(S/G) = G^{-2} \{ \text{var}(S) + (S/G)^2 \text{Var}(G) - 2(S/G) \text{Cov}(S,G) \}$$
 with the variances and co-variances estimated from the weighted relation of S and G over DOs. (The weighted correlation of S and G over 45 DOs is .936.)
7. Compare the (unpublished) Friskics-Warren letter to the local experts and the Census Bureau Regional Directors' letter to local governments (United States Department of Commerce 1989b with the Special Place Prelist Enumerators' Manual (U.S. Department of Commerce, 1989a).

8. The data analyzed in this paper differ from those analyzed in Schwede and Salo (1991) in the bundling of group quarters locations and by some revisions to the match between Census and expert lists of shelters as of the summer, 1990.

9. The local experts were admonished to use: "a. knowledge that they already possess, b. information gathered from experts, organizations, and any other sources, and c. fieldwork (for example, talking with outreach workers and to a cross-section of the homeless themselves)."

10. We call these three groups of expert lists "dependent," "contaminated," and "independent" respectively. It is reassuring to find that in the dependent lists, there are no shelters that are not also on the Census list. On average 90 percent of the shelters on the "contaminated" lists are also on the Census list and 87 percent of the shelters on the "independent" lists are also on the Census lists. (Those are unweighted averages over DOs.) In three districts the number of in-scope shelters on the expert list exceeds the number on the Census list (by no more than three). In four districts the numbers are equal, though it is not always because the lists are identical. In every other case, the number on the Census lists exceeds the number on the expert list. In 19 districts the number of shelters on the Census list is more than twice the number on the expert list.

11. The fact that the final Census list of group quarters contains a single emergency facility for juveniles leaves our confidence in this decision barely shaken.

12. Some such assumption appears required by the fact that over the 30 districts analyzed here, the (weighted) average number of shelters on the Census lists is 16.3 while the average number on the Expert lists is 8.1. (The standard deviations of these distributions are 13.2 and 7.3. Both distributions have minima of one. The maximum number of shelters per district is 56 for the Census and 29 for the Experts.)

13. For all but five of the 611 shelters underlying this analysis, we have either the official Census population count or an unofficial count gathered in summer of 1990. *Faute de mieux*, we take their population as zero for the five shelters for which neither population estimate is available.

14. Estimates were obtained using Fay's VPLX, version 92.03. We are indebted to Chris Moriarity for the calculations.

15. The 90 percent confidence intervals shown in Table 2 are estimated from the variances of the distributions of dual systems estimator for each district within stratum (and size-class). These intervals estimate sampling variance, but do not represent measurement (model) error. That is, we have taken account of the fact that the capture rate estimate for a stratum might be different if we took a different sample of DOs from it. We have not represented the fact that if we repeated these measurements on the same set of DOs i.e. repeated the assessment and the census, we would get different capture rates. Thus the metaphysical situation is we are inferring to the actual census and assessment as of Summer, 1990, not to all possible censuses and assessments conducted the same way. Since the average number of shelters on the expert lists is on the order of 10 per DO and the Census capture rate for a DO is estimated as a fraction with that number as the denominator, measurement error is likely not trivial.

16. We cannot address the question of whether the records of empty shelters canvassed are kept as assiduously as those of shelters with population.

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Table 1. -- S-Night Shelter Status of Locations Identified
by Local Experts. 45 District Offices, Summer, 1990

<u>Locations Identified by Local Experts</u>	<u>Number</u>	<u>Percent</u>
Total	1330	100%
Judged In-scope S-Night shelters	467	35%
Not judged In-scope S-Night shelters	863	65%
No living quarters (office or referral only, no shelter on premises)	213	16%
Outside DO boundaries	195	15%
Closed: Not yet open; Not found	41	3%
Non-S-Night hotel/motel	126	9%
Non S-Night locations valid for Census	272	20%
Housing units	132	10%
Abused women's shelters*	28	2%
T-Night	13	1%
Boarding house	8	1%
Other GQ type	91	7%
No reason given	16	1%

* Shelters for abused women received special treatment on S-Night.
They were excluded from the Assessment Study.

Table 2.-- Estimated Census Shelter Capture Rate by Size of Shelter

Dual Systems Estimates by Shelter Size Class

Size Class	Capture Rate	Std Error of Rate	90% Confidence Interval	Number of Shelters	
				Estimate	Std Error
Zero	47.0%	17.64%	18.0% - 76.0%	3548	1192
One to six	95.1%	2.64%	90.8% - 99.5%	1650	1691
Seven to fifteen	95.8%	2.45%	91.8% - 99.8%	1702	232
Sixteen to thirty-five	97.7%	1.88%	94.6% - 100.0%	1577	210
Thirty-six and over	99.6%	0.09%	99.5% - 99.7%	884	149
All sizes	78.0%	6.73%	67.0% - 89.1%	9361	1371
All sizes above zero	97.0%	1.26%	94.9% - 99.1%	5813	595

Estimates within Sampling Strata and Shelter Size Class

Size	Sampling Stratum	Adjusted Weight	Number of Listed Shelters				Census Capture Rate	
			Total	Census	Expert	Both	Estimate	Std Err
Zero	Certainty	1.2	8	8	3	3	100.0%	--
	I	13.8	52	48	7	3	42.9%	30.20%
	IIa	15.4	47	33	27	13	48.1%	6.24%
	IIb	23.8	22	15	11	4	36.4%	61.05%
	III	15.8	7	7	3	3	100.0%	0.00%
One to six	IV	19.6	1	1	0	0	--	--
	Certainty	1.2	9	6	4	1	25.0%	--
	I	13.8	32	30	5	3	60.0%	18.44%
	III	15.8	6	6	4	4	100.0%	0.00%
	IIa	15.4	39	39	19	19	100.0%	0.00%
Seven to fifteen	IIb	23.8	10	10	4	4	100.0%	0.00%
	IV	19.6	11	11	6	6	100.0%	0.00%
	Certainty	1.2	17	15	9	7	77.8%	--
	I	13.8	23	23	6	6	100.0%	0.00%
	III	15.8	6	4	5	3	60.0%	28.01%
Sixteen to thirty-five	IIa	15.4	37	37	21	21	100.0%	0.00%
	IIb	23.8	13	13	5	5	100.0%	0.00%
	IV	19.6	18	18	10	10	100.0%	0.00%
	Certainty	1.2	39	36	21	18	85.7%	--
	I	13.8	25	24	8	7	87.5%	13.65%
Thirty-six and over	III	15.8	6	6	5	5	100.0%	0.00%
	IIa	15.4	25	25	18	18	100.0%	0.00%
	IIb	23.8	14	14	6	6	100.0%	0.00%
	IV	19.6	18	18	6	6	100.0%	0.00%
	Certainty	1.2	75	73	54	52	96.3%	--
	I	13.8	3	3	2	2	100.0%	0.00%
	III	15.8	3	3	2	2	100.0%	0.00%
	IIa	15.4	25	25	20	20	100.0%	0.00%
	IIb	23.8	6	6	4	4	100.0%	0.00%
	IV	19.6	9	9	4	4	100.0%	0.00%