QUALITY CONTROL FOR DATA GATHERING IN THE MARYLAND HYPERTENSION SURVEY

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Background and Overview of the Maryland Hypertension Survey

From June 1, 1978 to March 1, 1979 the University of Maryland Department of Epidemiology and Preventive Medicine undertook a statewide survey of high blood pressure and its reported status of medical management. Additional variables surveyed included knowledge and attitudes about high blood pressure, availability, accessibility and use of medical care services, and health care reimbursement mechanism. The purpose of this survey is to:

(1) Provide some quantitative estimates required for the statewide planning of a Coordinated Hypertension Control Program (CHCP).

(2) Estimate the status of hypertension control in 1978-79 and compare it to the corresponding estimate from a non-over-lapping second survey to be conducted in 1981-82. This comparison will provide a measure of the impact of the CHCP. The 1978-79 survey sample consisted of two frames: the first frame contributed 85% of the sampling units and comprised area segments, (roughly equivalent to a block) from the 1970 census. The second frame which contributed 15% of the sampling units, comprised new construction permits issued since 1970 in the various geopolitical subdivisions of the state. Within both frames the sample design consisted of a stratified sample of clusters (about 6 households per cluster). The stratification was done according to geographic subdivision and economic rank for the area sample. Whereas for the sample of new construction permits the stratification was done according to geographic subdivision and year the permit was issued.

The Objectives of the Quality Control System

1. To monitor the representativeness of the sample surveyed.

2. To select for quality control check, those survey variables considered crucial for the planning and evaluation purpose, (blood pressure level, use of antihypertensive drugs etc.,).

3. To establish a feedback mechanism which will provide the interviewers with a quantitative evidence descriptive of the quality of their work and thus offer the interviewer the opportunity to selectively correct their work quality.

4. To estimate the extent of poor field work on the basis of a systematic sample and extend the quality control activities to 100% veriifcation of the work when poor quality is suggested.

The Representativeness of the Survey Sample was Monitored through:

(1) A periodic examination of the proportion of dwelling unit since the 1970 census by county. This examination indicated that the area sample surveyed yielded about as many housing units built since 1970 as those yielded by the survey based on new construction permits. This observation dictated that the sampling weights assigned to respondents residing in homes built since 1970 be divided by two.

(2) A biweekly monitoring of the enumeration and interview coverage rates by county. Examples of this monitoring are shown in Table 1a and 1b. This allowed us to anticipate a solution to problems of selective under coverage in certain areas. These areas showed more than average difficulty for survey completion. For example very early during our survey activities some sections of the inner city of Baltimore, as well as, areas of suburban Washington with intensive security protection were identified as being undercovered. The solutions adopted were: a) to redistribute interviewers from adjoining area to problem areas so as to increase the ratio of interviewers to assigned sample addresses in undercovered areas; b) to schedule several special weekend work retreats for the problem areas, these work retreats were staffed by volunteer interviewers from other areas as well as by the supervisory staff; c) to titrate work assignments so as to achieve an acceptable rate of survey coverage for each assigned workload prior to distributing the next work assignment; d) to supplement the field staff with untrained interviewer companions recruited by the interviewers themselves. These companions relieved the interviewers from some non-technical responsibilities such as driving, establishing appointments, mailings, etc.,; e) to conduct for each interviewer an analysis of the cost per interview (wages and mileage reimbursements). This analysis was performed monthly and results of this cost efficiency measure were distributed to all interviewers identified only by their code number.

The Selection of Survey Variables for Quality Control and the Results of the Quality Control Procedures

(1) External validation of completed enumeration and interview:

Due to the timelag between field work completion and external validation by the field supervisory staff, selection of the important variables to be validated was determined primarily by the likelihood of change overtime in the status of this variable. An ancillary consideration was to avoid selecting those measurements of information deemed sensitive such as income or marital status. The items included in a validation questionnaire are shown in Table 2. This questionnaire was administered to a systematic 1 in 10 sample of respondents. A posteriori it appears that the primary use of this external validation activity was to remind the interviewers of its existence and occasionally to provide the interviewer with individualized refresher instructions on selected points of the survey manual of operations. The overall analysis of the results of this external validation shown in Table 2 reveals that in very few instances and only for selected validation items were there any reports of dis-

crepancies between interviewers and field super-
visor.

(1) Internal Quality Control Editing.

Accuracy of blood pressure measurements and
its recording is crucial for the decision to re-
fer suspected hypertensives to a source of medical
care for diagnosis and/or treatment follow-up.
During the pre-survey training period, interview-
ers were instructed in the standardized measure-
ment and recording of blood pressure. Three
blood pressure readings were required for each of
the systolic and diastolic blood pressure levels.
The arithmetic average of the second and third
diastolic reading were used for decision to refer
suspect hypertensives to their personal sources
of medical care for diagnosis and treatment. Two
aspects of these measurements were conducive to
an internal quality control audit; namely: 1)
the relative frequency of similar first, second
and third readings by interviewer; 2) the ter-
minal digit preference recorded for any of the
six blood pressure readings. The relative fre-
quency of similar second and third blood pressure
readings is shown in Table 3. This analysis also
contrasts this observed frequency using a standard
mercury sphygmomanometer against the expected
frequency using random zero (RZ) blood pressure
measurement device. This device randomly masks
the zero level of the column of mercury prior to
each measurement. After each measurement is
obtained the zero level is unmasked and a cor-
rected reading is obtained.

Whereas the relative frequency of similar se-
cond and third readings using the (RZ) range from
10 to 25 percent and from 12 to 27 percent using
the standard device in conjunction with the RZ.
Use of the standard mercury sphygmomanometer a-
lone shows a higher relative frequency of identi-
cal second and third readings at every blood
pressure level. These results strongly suggest

the possibility that in some instances, some in-
terviewers do not actually measure and record
blood pressure three times but rather measure it
fewer times (one or two) and occasionally dupli-
cate the recording of a measured reading. The
analysis of the terminal digit preference reveals
as in many other blood pressure surveys. a pre-
ference for selected terminal digits namely zero
and eight. Systolic and diastolic readings by
age, of respondents is shown in Table 4.

Discussion

This paper described a list of quality control
steps, either taken or planned, for the Maryland
Hypertension Survey. Some of these steps appear
to be highly successful in achieving the objec-
tives for which they were instituted;among the
steps felt to successfully meet their objectives
are:

1) The ongoing monitoring of the completion
rates for household enumeration and in-
dividual interviews by region, by assign-
ment batch and by interviewer.

2) Due to the variable nature of some of the
crucial variables being measured ex:
blood pressure level. We feel that a per-
iodic statistical analysis of digit pre-
ference trends, and of similarity between
successive blood pressure readings coupled
with feedback of these results to the in-
terviewer is potentially more useful than
an extensive external validation effort.
Furthermore, the results of these statis-
tical analyses will help focus the atten-
tion of the clerical editors more sharply
on selected measurements.

The implication of quality measurements of
blood pressure level extends beyond the statis-
tical aspects of the data to encompass referral
decision, incurred cost and unneeded worry about
one's health. The scope of this implication
dictates that substantial investment in the
quality control activities of a hypertension sur-
vey be not only considered necessary because of
its importance in quantitative sciences, but also
crucial from the point of view of ethical inter-
vention into other peoples lives.

Table 1a

Cumulative Percent Enumeration Completion by Assignment Cohort
Maryland 1978-79

		Month of Completion									
		June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March+	Total*
	June N	349	376	123	49	35	26	48	44	33	54	1288
	Cum %	27.1	56.3	65.9	69.7	72.4	74.4	78.1	81.5	84.1	88.3	88.3
	July N	0	105	211	77	35	13	30	25	25		593
	Cum %	-	17.7	53.3	66.3	72.2	74.4	76.6	81.7	85.9	90.1	90.1
	Aug. N	0	0	105	254	112	22	27	30	18	48	708
	Cum %	-	-	14.8	50.7	66.5	69.6	73.4	77.6	80.1	86.9	87.0
Month of	Sept.N	0	0	0	69	155	30	64	37	40	34	508
Assignment	Cum %	-	-	-	13.6	44.1	50.0	62.6	69.9	77.8	84.5	84.4
	Oct. N	0	0	0	0	118	88	106	87	64	57	630
	Cum %	-	-	-	-	18.7	32.7	49.5	63.3	73.5	82.6	82.5
	Nov. N	0	0	0	0	0	21	44	33	19	12	160
	Cum %	-	-	-	-	-	13.1	40.6	61.2	73.1	80.6	80.6
	Dec. N	0	0	0	0	0	0	7	9	6	12	36
	Cum %	-	-	-	-	-	-	19.4	44.4	61.1	94.4	94.4
	Jan. N	0	0	0	0	0	0	0	2	2	5	20
	Cum %	-	-	-	-	-	-	-	10.0	20.0	45.5	45.0
	Feb. N	0	0	0	0	0	0	0	0	6	10	25
	Cum %	-	-	-	-	-	-	-	-	24.0	64.0	64.0
	Total	349	481	439	449	455	200	309	272	213	257	3968
		8.8	20.9	3.2	43.3	54.8	59.8	67.6	74.5	79.9	86.4	86.4

*All assigned addresses.

Table 1b.

Cumulative Percent Screening Completion by Assignment Cohort
Maryland 1978-79

		Month of Completion									
		June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar+	Total*
	June N	632	769	237	89	53	37	76	76	54	50	2274
	Cum %	27.8	61.6	72.0	75.9	78.2	79.8	83.1	86.4	88.8	91.0	91.2
	July N	0	202	439	151	64	20	22	52	29	27	1095
	Cum %	-	18.5	58.6	72.4	78.2	80.0	82.0	86.8	89.5	92.0	91.9
	Aug. N	0	0	198	491	215	40	58	52	31	68	1230
	Cum %	-	-	16.1	56.0	74.5	76.8	81.5	85.7	88.2	93.7	93.7
Month of	Sept N	0	0	0	144	291	73	114	61	61	39	853
Assignment	Cum %	-	-	-	16.9	51.0	59.6	73.0	80.2	87.4	92.0	91.8
	Oct. N	0	0	0	0	230	175	204	132	115	65	1013
	Cum %	-	-	-	-	22.7	40.0	60.1	73.1	84.5	90.9	90.0
	Nov. N	0	0	0	0	0	37	82	64	39	15	262
	Cum %	-	-	-	-	-	14.1	45.4	69.8	84.7	90.4	90.5
	Dec. N	0	0	0	0	0	0	9	16	15	15	62
	Cum %	-	-	-	-	-	-	14.5	40.3	64.5	88.7	88.9
	Jan. N	0	0	0	0	0	0	0	3	2	7	13
	Cum %	-	-	-	-	-	-	-	23.1	38.5	92.4	92.3
	Feb. N	0	0	0	0	0	0	0	0	0	12	28
	Cum %	-	-	-	-	-	-	-	-	-	32.1	75.0	75.0
	Total	632	971	874	875	853	382	565	456	355	298	6830
		9.3	23.5	36.3	49.1	61.1	67.2	75.5	82.2	87.4	91.8	91.8

*All assigned adults

Table 2

DISC

VALIDATION QUESTIONNAIRE

Program Number:_____

Name: _____

Phone Number: _____

Date of Interview:_____

Date of Validation:_____

Name of Validation:_____

"Hello, this is (your name), field supervisor of the Demonstration of the Impact of Statewide Hypertension Coordination Study. I am calling to thank you for your cooperation in allowing (name of interviewer) to take your blood pressure at your home on (date). We hope this has not been an inconvenience for your and we do appreciate the value of your help in our hypertension study. I would like to take a few more minutes of your time and ask a few questions which will allow us to check the accuracy of our interviewer."

Validation Question	Ans. on 01/02	Ans. on Val.	No. of Errors	Comments
1a. Verify present address.				
b. How long have you lived at this address.				
2. How many household members living at this address are 18 years old or older?			11	
3. Was an interview conducted and the blood pressure taken for each of these individuals?			6	
4. Have your ever been told by a doctor that you had high blood pressure?			3	
5a. Are you taking any prescription medicine?			5	
b. (If yes) How many?			5	
6a. If respondents blood pressure was elevated (age 50, 90 mm Hg; age 50, 95 mm Hg): Did the interviewer give you a yellow postcard to give to your doctor?			7	
b. Complete telephone follow-up (DI05)			2	

Table 3

Percent Identical Second and Third Blood Pressure Readings by Diastolic Blood Pressure Level. Using Standard Sphygmomanometer Alone vs Random-Zero vs Standard Used in Conjunction with Random Zero

Diastolic Blood Pressure Level (mm Hg)

	< 90		90-94		95-99		100-104		105-114		≥115	
	N	%	N	%	N	%	N	%	N	%	N	%
Standard	1954	34.8	147	38.6	38	25.5	32	43.2	14	23.7	5	21.7
RZ (03)			50	19.4	29	15.2	35	21.3	40	18.4	21	14.1
Stand. + RZ (03)			55	21.3	39	20.4	30	18.3	33	15.2	31	20.8
RZ (04)	35	16.3	37	23.7	19	11.5	28	21.1	24	13.7	14	13.7
Stand. RX (04)	40	18.6	31	19.9	39	23.5	26	19.6	31	17.7	21	20.6
RZ (20)	91	17.8	29	24.6	9	10.5	12	20.7	6	10.9	2	7.4
Stand. + RZ (20)	94	18.4	17	14.4	10	11.6	8	13.8	15	27.3	5	18.5

Table 4

Terminal Digit Preference by Age of Respondent for the Second Diastolic and Systolic B.P. Reading

	Diastolic				Systolic			
	50 Yrs. Old		50 Yrs. Old		50 Yrs. Old		50 Yrs. Old	
	N	%	N	%	N	%	N	%
End Digit = 0	960	22.6	533	24.5	1090	25.7	583	26.7
End Digit = 2	786	18.5	298	18.3	774	18.2	413	18.9
End Digit = 4	729	17.2	398	18.3	672	15.8	361	16.6
End Digit = 6	785	18.5	354	16.2	791	18.6	326	15.0
End Digit = 8	983	23.2	493	22.6	917	21.6	494	22.7