

Based on experience gained in the study and from conducting the workshop, we prepared an instructor's manual, a student manual, and an actual practice manual, which are now used in followup family planning courses conducted all around the country to teach "multipliers"—persons who can teach primary health care workers and develop additional instructors.

With the task analysis and job design approach described in this paper, mid-career primary health care workers have been trained for Bolivia, Brazil, Colombia, Ecuador, Honduras, Peru, and other areas of Latin America. The workers trained have included physicians, nurses, and social workers. These procedures currently are being implemented in a number of agencies in family planning, mental health, and other health programs in Colombia, Mexico, and Nicaragua. Finally, the approach outlined here has been used in redesigning the curriculums at several universities in Mexico.

### Conclusion

The same basic approach that was developed and used in industrial settings to evaluate manual-job levels and that has been applied in acute care settings in the United States can be used in primary care settings in developing regions of Latin America (13-15). With this approach, new job categories can be formulated that will contribute to more cost-effective health care.

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## Characteristics of Recipients in Florida's Long-Term Program of Insulin Distribution

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### SYNOPSIS

*Since 1935 the State health agency has provided insulin to medically indigent diabetics in Florida.*

During 1980, data were collected on 9,429 recipients regarding their age, race, sex, height, weight, and type and dosage of insulin.

The mean age was 55 years; 47 percent were white and 52 percent were black. Seventy-two percent of the recipients were females and 28 percent were males.

The utilization rate was much greater for blacks than for whites in all age-sex groups. Seventy-two percent of the estimated number of insulin-requiring black females used insulin supplied by the health agency, compared with 9 percent of insulin-requiring white females in the State. For black males, the proportion was 37 percent and for the white males, it was 5 percent.

Obesity was defined as a Body Mass Index (BMI) of greater than 25 for females and greater than 27 for males. The mean BMIs were 30.9 for females and 27.7 for males. In all age groups, women were more obese than men, and blacks were more obese than whites except for the oldest age group, those 65 and older.

The mean total daily dosage of insulin was 46 units, and 95 percent of recipients used NPH or Lente insulin. Insulin dosage per kilogram of body weight showed some decrease as weight increased. The authors concluded that the Florida program reaches a significant proportion of its target population.

THE FLORIDA STATE BOARD OF HEALTH and its successor, the Florida Department of Health and Rehabilitative Services (HRS), have distributed insulin to medically indigent persons since 1935. The insulin is sent to the 67 county health units from the HRS Pharmacy for distribution to clients. In a few counties, clinics of public hospitals and migrant health clinics distribute the insulin. Patients are given the type of insulin prescribed by a public health or private physician.

This report is an attempt to characterize persons receiving insulin through this program. In addition, as far as is possible, we have attempted to evaluate the success of the program in reaching its target population.

## Methods

In this report, a recipient is defined as a person who received insulin through the HRS insulin program in 1980 and for whom an insulin client registry card (HRS-H form 2026) was created in the county health unit. Insulin recipients are defined as medically indigent, and they become eligible to receive State-purchased insulin only after meeting stringent criteria. The recipient must receive either Supplemental Security Income (SSI) or Aid to Families with Dependent Children (AFDC), be eligible for the HRS Children's Medical Services Program, or have a gross income equal to or less than the established levels (table 1). Financial eligibility must be reviewed every 6 months.

The following data were collected for each insulin recipient: age, race, sex, height, weight, type and dosage of insulin, and county distributing the insulin. The sources of the data were the client registry cards kept in each county health unit and represent the information available for 9,429 clients.

Midyear 1979 population estimates were obtained from the Bureau of Economic and Business Research, University of Florida. Prevalence rates for diabetes and insulin use were obtained from the 1976 and 1978 National Health Interview Surveys, respectively (unpublished data from the National Center for Health Statistics) and were used to estimate the total diabetic population in Florida.

## Results

Nearly complete data for age, race, sex, and insulin type and dosage were available; height and weight were less completely reported, as the following tabulation shows.

Item	Percent reported
Age	93
Race	95
Sex	98
Height	14
Weight	35
Insulin type	99+
Insulin dosage	99+

The vast majority of the recipients were more than 44 years old, and many were over 64 years old

(table 2, column B); the mean age was 55. Forty-seven percent of the recipients were white, and 52 percent were black. Few were listed as Spanish, but they were likely to be included in the white category. Nearly three-fourths (72 percent or 6,663 persons) were female, and 28 percent (2,601 persons) were male.

The number of diabetics in the total population of Florida was calculated, given age-specific prevalence rates and population estimates. The observed

number of HRS insulin recipients divided by the estimated number of diabetics for the State yielded a use rate for the HRS insulin (table 2, column C). When recipients were separated into age groups by sex and race, consistent use patterns emerged. The use rates for blacks was much higher than the rate for whites, and the rates for females were much higher than those for males (table 2, column C).

Data from the 1976 National Health Interview Survey of the National Center for Health Statistics allow a calculation of the number and rate of insulin users among diabetics in each race-sex group (table 2, columns D and E). Using the number of insulin-requiring Floridians, the proportions of those in need who receive HRS insulin were calculated (table 2, column F). Of the 4,741 insulin-requiring black females, 72.3 percent received HRS insulin, compared with 9.1 percent of 30,094 insulin-requiring white females. For black males, the rate was 37.4 percent and for white males, 5.2 percent. Females had higher use rates than males in all age-race groups. There was a decrease in use rates with increasing age among program recipients for each race-sex group except the white males.

Height and weight were available for only 1,033 (11 percent) of the recipients. In addition, 30 percent of the height and weight data were from Hills-

Table 1. Income standards for recipients in Florida's insulin distribution program

Family size	Weekly	Monthly	Annual
1	\$117.69	\$ 510	\$ 6,102
2	145.38	630	7,560
3	173.08	750	9,000
4	200.77	870	10,440
5	228.46	990	11,880
6	233.77	1,013	12,156
7	238.85	1,035	12,420
8	244.15	1,058	12,696
9	249.23	1,080	12,960
10	254.54	1,103	13,236
11	259.62	1,125	13,500
12	264.69	1,147	13,764

Table 2. Recipients of Florida's insulin distribution program compared with the State's estimated population of diabetics

Race and age	Estimated diabetics in Florida <sup>1</sup> A	Insulin program recipients		Estimated insulin-using diabetics in Florida <sup>2</sup>		Percent of Florida insulin users in State program F
		B	Percent of Florida diabetics C	Number D	Percent of diabetics E	
Total, white males	104,163	1,277	1.2	24,686	23.7	5.2
Under 45 years	16,413	381	2.3			
45-64 years	45,494	462	1.0			
65 years and older	42,256	434	1.0			
Total, black males	10,572	1,074	10.2	2,865	27.1	37.4
Under 45 years	2,002	282	14.1			
45-64 years	5,169	494	9.6			
65 years and older	3,401	298	8.8			
Total, white females	160,932	2,722	1.7	30,094	18.7	9.0
Under 45 years	17,125	516	3.0			
45-64 years	60,496	1,077	1.8			
65 years and older	83,311	1,129	1.4			
Total, black females	21,952	3,430	15.6	4,741	21.6	72.3
Under 45 years	2,312	669	28.9			
45-64 years	12,028	1,830	15.2			
65 years and older	7,612	931	12.2			

<sup>1</sup> Based on mid-year population estimates, 1979, Bureau of Economic and Business Research, University of Florida, and National Health Interview Survey, 1978, National Center for Health Statistics.

<sup>2</sup> Based on midyear population estimates, 1979, Bureau of Economic and Business Research, University of Florida, and National Health Interview Survey, 1976, National Center for Health Statistics.

*'Obesity has been considered by some to be an important cause of noninsulin-dependent diabetes and by others to be at least an important factor when the person becomes insulin-requiring.'*

borough County, and Hillsborough accounted for only 9 percent of the total insulin recipient population. Two biases are possible which could make the data unrepresentative of the entire population: (a) a systematic bias of weighing only certain people (the noticeably thin or obese, for example), and (b) Hillsborough County has a population different from the rest of the State. These biases were tested by dividing the data into four groups:

1. weighed and measured
2. unweighed and unmeasured
3. State without Hillsborough County
4. Hillsborough County.

The age-race-sex insulin dosages were the same for all four groups. We concluded that the available height and weight data were representative of the total population.

Table 3. Recipients in Florida's insulin distribution program according to Body Mass Index, age groups, race, and sex

Race, sex, and Body Mass Index	Under 45 years	45-64 years	65 years and older	Total
<b>White males</b>				
27 or less	41	27	31	99
More than 27	16	36	21	73
<b>Black males</b>				
27 or less	8	13	14	35
More than 27	10	19	15	44
<b>White females</b>				
25 or less	51	29	50	130
More than 25	35	156	123	314
<b>Black females</b>				
25 or less	18	26	21	65
More than 25	53	150	70	273
<b>Total</b>	<b>232</b>	<b>456</b>	<b>345</b>	<b>1,033</b>

NOTE: Body Mass Index is weight in kilograms divided by height squared in meters.

Table 4. Recipients in Florida's insulin distribution program according to Body Mass Index (BMI) and insulin dose

BMI and sex	Insulin dose per kilogram of weight				Total
	Less than .8 unit		.8 unit or more		
	Number	Percent	Number	Percent	
Total female <sup>1</sup>	553	74	193	26	746
20 or less	24	58	18	42	42
21-25	113	74	40	26	153
26-35	270	72	109	28	379
36 or more	146	81	36	19	182
Total male <sup>2</sup>	215	84	40	16	255
20 or less	28	74	10	26	38
21-27	84	84	16	16	100
28-35	73	87	11	13	84
36 or more	30	91	3	9	33

<sup>1</sup>  $\chi^2 P < .001$ .  
<sup>2</sup>  $\chi^2 .05 < P < .1$ .

NOTE: Body Mass Index is weight in kilograms divided by height squared in meters.

Obesity has been considered by some to be an important cause of noninsulin-dependent diabetes and by others to be at least an important factor when the person becomes insulin-requiring (1). There are several measures of obesity presently available, but the National Diabetes Data Group (NDDG) recommends the use of the Body Mass Index (BMI) or weight in kilograms divided by height squared in meters (1). Various definitions of obesity can be applied to a population group. The NDDG recommends a BMI greater than 25 to define obesity for females and greater than 27 for males (1).

A greater proportion of females than of males were obese; females were more obese, with a mean BMI of 30.9 compared with 27.7 for males. Although the numbers are small, a greater proportion of black males and females under 45 years were obese than were their white counterparts (table 3). In all four race-sex groups of those 65 and older, the proportion who were obese diminishes when compared to those aged 45-64 years.

The vast majority of clients, 95 percent, were on NPH or Lente insulin. About 10 percent (899) used a mixed dosage—usually regular and an intermediate insulin. For those on a mixed dosage, the average dose was 65 units per day. The youngest recipients were most likely to be on mixed insulin. Twenty-seven percent of those 24 and younger used a mixed dosage, and only 7 percent of those older than 64 years used mixed insulin dosages. The sex

and race distributions for those on mixed dosages did not differ from the total distributions for sex and race.

Total dosage of insulin did not take body mass into consideration. To evaluate better the appropriateness of a given dosage, the dosage was calculated per kilogram of body weight (table 4). The mean total dosage per kilogram was .59 unit for males and .67 unit for females. The analysis showed that 74 percent of female recipients and 84 percent of male recipients were on less than .8 unit per kilogram of body weight per day. When the dosages were analyzed by age, race, and sex, there was no difference in the total daily dosage per kilogram. The most obese tend to be prescribed less insulin per kilogram of weight. The most obese groups had fewer recipients on more than .8 unit per kilogram and, for females, this trend was highly significant ( $P < .001$ ). Degree of obesity appears to be the best predictor of dosage per kilogram.

## Discussion and Conclusions

This analysis was the first systematic investigation of HRS insulin recipients. The data suggested that the typical recipient was likely to be female rather than male, more than 55 years old, about equally likely to be white or nonwhite, relatively obese, and to take about 46 units per day, or .6 units per kilogram of body weight, of either NPH or Lente insulin.

The population served has been very clearly defined. That the proportion of blacks participating is manifold that for whites is not surprising. In Florida, 32.4 percent of blacks and 9.4 percent of whites are considered indigent by the criteria outlined previously (2). Rather, the data suggest that this insulin program reaches its target population effectively. We conclude that the program has successfully reached its stated objective: supplying insulin to medically indigent Floridians.

We are unable to explain the underutilization of the program by both black and white males. Findings of the 1976 National Health Interview Survey suggest that the proportion using insulin is greater for males than for females for both races (table 2, column E). Additional studies attempting to explain this discrepancy are planned.

The data on obesity are limited in scope and, therefore, their significance should be cautiously interpreted. Nevertheless, our attempts at verification showed the data to be representative of the entire State. The limited data show that 75 percent of

black women and 56 percent of black men who were under age 45 were obese. Better evidence concerning the type of diabetes is needed, because younger patients are traditionally thought to be insulin-dependent and lean. These patients may indeed be noninsulin-dependent. Further study seems indicated.

The decrease in obesity observed in this population after age 65 has been seen in other studies (3). The most obese either die or lose weight. The correlation of obesity to cardiovascular death makes the former prospect more likely. A cohort study is indicated to define better the natural history of the disease and the outcome of those with varying degrees of obesity.

Furthermore, the data suggest that insulin dosage per kilogram does not appear excessive for most patients. Most diabetologists begin to consider insulin usage excessive at a dosage greater than .8 to 1.0 unit per kilogram of weight (4). Nearly 90 percent of HRS insulin recipients are on smaller doses. In addition, many diabetologists insist that obesity-related diabetes ought to be treated with diet and that insulin should only be used when hyperglycemia cannot be controlled by diet. Given this rule, the tendency to use less insulin per kilogram of body weight in the obese allows a tentative conclusion that most physicians seem to be attempting to use insulin judiciously with obese patients. This conclusion needs to be investigated more fully by following a cohort of patients whose weight history and insulin dosage history are available. Patient data cards may not be adequate for such a study.

This analysis left a number of questions unanswered, but it provided evidence that this is a successful public health program in that it reaches those it is designed to assist. The findings also point to possible topics of further data collection concerning the population of HRS insulin recipients in the State.

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