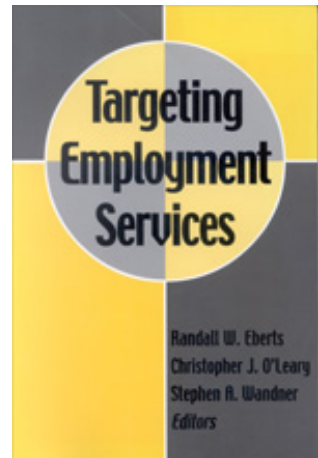

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Using Statistical Assessment Tools to Target Services to Work First Participants

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8

Using Statistical Assessment Tools to Target Services to Work First Participants

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This chapter describes the design and evaluation of a recently completed Work First pilot, funded by the Employment and Training Administration of the U.S. Department of Labor, which uses statistical methods to assess each customer's employability and then uses the assessment to refer them to services. The pilot addresses the need for early identification of employment barriers faced by welfare recipients and for the targeting of services. Welfare-to-work programs typically treat all recipients the same, providing the same basic services regardless of a participant's skills, aptitudes, and motivation. Yet, barriers vary widely. Some customers require little assistance in finding a job, while others have multiple barriers and stand to benefit from more intensive, targeted services.¹ However, most Work First programs do not have sufficient funds to provide case managers for all customers who need more specialized attention and advocacy.

This pilot develops administrative tools to target services to customers without changing the nature of the program or significantly raising costs. Statistical techniques were developed to estimate the likelihood of employment based on participants' demographic and work history information found in administrative records. An employability score was computed for each customer and was then used to assign each participant to one of three providers. Each provider offered the same basic set of services but differed in the mix of services and in their approach to delivering services. The pilot used these differences to de-

termine the best provider for each customer. The pilot was designed by the W.E. Upjohn Institute for Employment Research and conducted in Michigan at the Kalamazoo/St. Joseph Workforce Development Board (WDB), which is administered by the Institute.

The evaluation, based on random assignment, provides evidence that the pilot was successful in using statistical tools to improve program outcomes by placing more welfare recipients into jobs. It showed that the statistical assessment tool successfully distinguished among participants with respect to barriers to employment. It also found that referring participants to service providers according to their individualized statistical needs assessment (employability score) increased the overall effectiveness of the program as measured by the program goal of customers finding and retaining a job for 90 consecutive days.

MICHIGAN'S WORK FIRST PROGRAM

Program Overview

The purpose of Michigan's Work First Program is to move welfare recipients into jobs as quickly as possible. It was developed from waivers to Aid to Families with Dependent Children (AFDC), approved by the Clinton Administration in 1994 and 1996, and has continued under Temporary Assistance for Needy Families (TANF). The program provides welfare recipients reemployment skills, support, and opportunities to obtain employment, and it offers instruction in the proper techniques for writing resumes, completing applications, and interviewing for jobs. All enrollees receive similar services regardless of their needs. More intensive skill training is available only to those who hold a job or those who have repeatedly failed to find employment. After clients complete the core services, they are expected to search intensively for work and accept offers that provide at least 20 hours of work per week at or above minimum wage.² Customers employed for 90 consecutive days in a qualified job are considered a successful outcome, and they are terminated from the program. As an incentive for finding work, participants are allowed to keep the first \$200 earned each month and 20 percent over that without reducing benefits. Partic-

ipants also receive transportation, child care, and Medicaid for a limited time.

This statistical assessment model was based on the outcomes of participants entering the program during 1996. Table 8.1 displays the characteristics of Work First participants who enrolled in the program in 1996. Participants were predominantly single parents who had not completed high school and who had been on welfare for less than 36 months during the last five years. Some of the participants had completed a general equivalency diploma (GED), but few received vocational training.

Work First participants engaged in a variety of activities as part of their requirement for successfully participating in the program. Most participants began with assessment and employability planning (code 12). As shown in Table 8.2, 83 percent of all participants received these services in 1996. The percentage was higher for those who were not employed prior to entering Work First, about 90 percent. Around half of the participants engaged in group or individual job-search assistance, which includes counseling, job-seeking skills training, and may include support on a one-to-one basis (code 13). Fifty-three percent were employed in a job (code 1) that paid minimum wage or more and the employment was for 20 hours or more per week (or 35 hours if a working spouse). Another 6 percent were employed in unsubsidized employment that did not meet the requirements of code 1. Nineteen percent of the participants were in unsubsidized employment when referred, obtained subsidized employment meeting the requirements of code 1 prior to reporting, or obtained the appropriate employment prior to reporting to the first activity. Only a handful of participants (2 percent) were referred to community service programs or vocational educational training.

Differences in Activities among Providers

The Kalamazoo/St. Joseph WDB contracted with three organizations to provide employment services to participants of the Work First program. The providers delivered services that met state and federal requirements regarding content and duration. However, there was some flexibility within the requirements. WDB staff observed that providers differed in their styles and philosophies in delivering services

Table 8.1 Variables Used in the Work First Statistical Assessment Model

Name	Description	Mean (%)
sglprnt	=1 if single parent	82.7
age	Age at time of enrollment (yr.)	29.7
age2	Age squared	
noschl	No formal schooling	3.8
grlt9	Completed less than 9th grade	5.6
gr9	Completed 9th grade	5.6
gr10	Completed 10th grade	8.9
gr11	Completed 11th grade	19.1
gr12	Completed 12th grade	38.7
	(omitted from analysis, thus reference)	
post1	Completed one year of postsecondary	1.2
post2	Completed two years of postsecondary	1.6
post3	Completed three years of postsecondary	0.4
post4	Completed four years of postsecondary	0.1
ged	Earned GED certification	16.1
YOU	Youth Opportunities Unlimited	18.9
Goodwill	Goodwill Industries	17.9
foundat	Behavioral Foundation	30.3
comstock	Comstock	4.5
sturgis	Sturgis	4.0
rivers3	Three Rivers	24.0
voced	Attended postsecondary vocational education program	1.4
notarget	Not a target group, which includes AFDC received in any 36 of preceding 60 months, youngest child 16–18, or custodial parent under 24 and who has not completed high school or with little or no work experience	52.8
AFDC36	Received AFDC any 36 of preceding 60 months	34.3
code20_1	Qualified unsubsidized employment prior to assignment	19.0
code20_2	Qualified unsubsidized employment prior to assignment in previous enrollment	0.3

Table 8.1 (Continued)

Name	Description	Mean (%)
nocmpl	Terminated as noncompliant in previous enrollment (code 59, 60, or 61)	5.7
employed	Terminated as employed in qualified unsubsidized job	42.7
Observations		1,546

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

Table 8.2 Selected Activities of Work First Programs

Activity	Code	Mean (%)	Standard deviation	Minimum	Maximum
Unsubsidized employment	01	53	0.50	0	1
Job readiness	10	9	0.28	0	1
Assessment and employ- ability planning	12	83	0.37	0	1
Job search	13	55	0.50	0	1
Part-time employment	19	6	0.24	0	1
Employment prior to assignment	20	19	0.39	0	1
Community service	33	1	0.11	0	1
Voc. ed. training	34	1	0.09	0	1

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

and in the number of hours in which participants were engaged in specific activities. These observed differences were critical to the pilot by providing the opportunity to refer participants to the provider, and thus the mix and style of services, that best met their needs.

The length of time that Work First enrollees engaged in activities varied by type of activity and by subcontractor. For example, as shown

in Table 8.3, 38.1 percent of the participants spent two hours in the assessment and employability planning activity, while 39.6 percent spent 20 hours in the same activity. Of the three subcontractors within the Kalamazoo area, Youth Opportunities Unlimited (YOU) averaged 7.3 hours, the Behavioral Foundation 11.2 hours, and Goodwill 16.0 hours in this activity. The higher average for Goodwill results from a much larger percentage of participants spending time in the services than those assigned to other providers. More than three-quarters of those going to Goodwill spent 20 hours in this service. Only 27 percent of the participants receiving services from either YOU or the Foundation

Table 8.3 Distribution of Hours Engaged in Assessment and Employability Planning

Hours	Percentage			
	All	Foundation	Goodwill	YOU
1	5.9	1.9	1.9	14.6
2	38.1	38.3	19.0	52.8
3	0.2	0.5	0.0	0.0
4	0.4	0.5	0.5	0.0
5	0.1	0.0	0.5	0.0
6	0.1	0.0	0.0	0.4
7	0.0	0.0	0.0	0.0
8	0.1	0.0	0.0	0.4
9	0.0	0.0	0.0	0.0
10	0.1	0.0	0.0	0.4
11	0.7	0.0	0.5	1.9
12	0.2	0.5	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.2	0.5	0.0	0.0
15	4.8	11.1	0.0	0.0
16	9.3	19.6	0.9	1.9
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	39.6	26.9	76.8	27.7

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

received 20 hours of this service. For those going to YOU, two-thirds of the participants received two hours or less of assessment and planning. Time spent in this activity for those receiving services from the Foundation were split between 2, 15 or 16, and 20 hours. The wide distribution may indicate that these individuals have more discretion in how much time they spend in various activities.

Hours spent in group or individual job-search activities were much more uniform. Ninety-seven percent of the participants spent 20 hours, and there was no significant difference in the amount of hours the three subcontractors devoted to this activity.

Providers also differed in their approaches to delivering services. For instance, one provider stressed a goal-oriented approach to job search, requiring that participants call a given number of employers each day until they found a job. Another provider offered more assistance to customers in conducting phone inquiries and interviewing for jobs. Staff would work directly with customers to show them how to find employment postings and telephone numbers, how to inquire about the job posting, and how to present themselves during interviews. This same organization would also provide more intensive training at times to those who were not able to find a job during their initial several weeks in the program.

STATISTICAL ASSESSMENT MODEL

The purpose of the statistical assessment (or statistical profiling) model is to use information commonly collected during the intake process to identify Work First participants who are likely to obtain employment with minimal intervention (or conversely, to identify individuals who need the most assistance in finding and maintaining employment). The following information is available at intake and is used as explanatory variables in the statistical assessment model: age, parental status, educational attainment, AFDC history, service provider, target group, employment prior to enrolling in Work First, and compliance history of participant if they were previously enrolled in the program. During the operation of the pilot, a successful outcome was defined as working in a qualified job for 90 consecutive days (with a grace period

of no longer than a week if they changed jobs). A qualified job must offer a single parent at least minimum wage and 20 hours a week.

Data were obtained from the intake forms and the tracking system developed and maintained by the Kalamazoo/St. Joseph WDB. For most participants, multiple activities were recorded. The type of activity, the number of hours engaged in each activity, and the starting and ending dates of each activity were included in the files. Consequently, it was possible to piece together a sequence of activities between the time participants entered and left the program.

A logistic statistical procedure was used to estimate the relationship between a Work First participant's personal characteristics and the likelihood of finding qualified employment. The dependent variable in this statistical model is discrete, taking on the value of 1 (if employed) or 0 (if not employed). The probability of employment lies between 0 and 1 (that is, 0 percent and 100 percent). A logistic estimation procedure transforms the discrete event into a smooth functional form bounded by 0 and 1 and estimates the effect of specified variables on the probability of employment.

Estimates were based on a sample of Work First participants from the Kalamazoo/St. Joseph WDB who enrolled in the program during 1996. The 1996 period was used because all who enrolled in Work First during that time had completed the program before the start of the pilot and thus their outcomes were known.³ The variable definitions and sample means are displayed in Table 8.1.

Results of the logit estimation are shown in Table 8.4. Focusing on the signs of the statistically significant coefficients, Work First participants are more likely to complete 90 consecutive days of employment if they had completed 12th grade (the omitted variable in the equation), were older, were employed prior to first assignment, enrolled in the program earlier in the year rather than later, and were not out of compliance if they had previously enrolled in Work First.⁴

The only variable that may need an explanation for its inclusion in the model is the date of admission into Work First. The coefficient on this variable is negative and statistically significant. Therefore, those who enrolled in Work First in more recent periods experienced a lower probability of finding and maintaining employment for 90 consecutive days. The percentage of Work First participants reaching this status

Table 8.4 Logit Estimates of the Basic Statistical Assessment Model

Variable	Coefficient	Standard error	z	P> z	95% Confidence interval	
					Lower limit	Upper limit
sglprnt	0.223	0.156	1.429	0.153	-0.083	0.528
age	0.115	0.041	2.790	0.005	0.034	0.196
age2	-0.002	0.001	-2.602	0.009	-0.003	-0.000
noschl	-1.801	0.555	-3.244	0.001	-2.889	-0.713
grlt9	-0.454	0.304	-1.495	0.135	-1.049	0.141
gr9	-0.167	0.252	-0.662	0.508	-0.661	0.327
gr10	-0.775	0.218	-3.553	0.000	-1.203	-0.348
gr11	-0.431	0.157	-2.744	0.006	-0.739	-0.123
ged	0.174	0.162	1.074	0.283	-0.143	0.492
voced	-0.591	0.487	-1.212	0.225	-1.546	0.364
post1	0.079	0.501	0.159	0.874	-0.903	1.062
post2	0.162	0.438	0.371	0.711	-0.695	1.020
post3	0.011	0.884	0.013	0.990	-1.721	1.744
goodwill	-0.463	0.187	-2.485	0.013	-0.829	-0.098
foundat	-0.560	0.164	-3.406	0.001	-0.883	-0.238
sturgis	0.005	0.300	0.017	0.986	-0.582	0.593
comstock	0.127	0.302	0.421	0.673	-0.465	0.719
rivers3	-0.454	0.172	-2.641	0.008	-0.791	-0.117
notarget	0.064	0.116	0.555	0.579	-0.163	0.292
addate	-0.003	0.001	-5.424	0.000	-0.004	-0.002
code20_1	1.107	0.144	7.683	0.000	0.825	1.390
code20_2	-0.393	1.055	-0.373	0.709	-2.46	1.674
nocmpl	-0.750	0.281	-2.672	0.008	-1.301	-0.200
Constant	36.921	7.260	5.086	0.000	22.693	51.150
No. observ.	1,546					
Pseudo R^2	0.1010					

NOTE: Dependent variable: employed for 90 days = 1; log Likelihood = -948.47621; $\chi^2(23) = 213.10$; Prob > $\chi^2 = 0.0000$.

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996-1997.

steadily declined from the first quarter of 1996, when the sample began. During the first and second quarters of 1996, 53 percent of participants in the sample were employed for 90 days, after which the percentage dropped to 50 percent during the third quarter, 31 percent during the fourth quarter, and 24 percent during the first quarter of 1997. The admission date variable can be interpreted as a proxy for attributes of Work First participants that are not captured in the characteristics included in the model. Work First staff observed that as the pool of welfare recipients going through the program diminished, enrollees were increasingly less qualified to find and hold jobs. The variable may also capture changes in the program and changes in local labor market conditions over time.

Applying the estimated coefficients to the characteristics associated with each Work First participant yields predictions of the probability of employment for each individual. Consequently, each Work First enrollee can be ranked according to their estimated probability.⁵ For heuristic purposes, one can view the distribution of employability scores as representing participants lined up to enter the Work First program according to their probabilities of finding employment. If the door is envisioned to be on the left side of the graph in Figure 8.1, those with the least propensity to find a job are at the front of the line, and the participants with the highest propensity are at the end of the queue. According to our model, the estimated probabilities of employment range from a low of 0.02 to a high of 0.85. Therefore, the person at the head of the line has almost no chance of finding a job and would need considerably more assistance than the person at the end of the line, who is almost certain to find employment without much help. Although 43 percent of the Work First participants in the sample found employment, the model did not assign anyone a probability of 100 percent. However, the spread is quite large, spanning most of the range from 0 to 1.

The assignment of participants to a provider was based on the participant's employability score. The distribution of scores was divided into three groups, as shown in Figure 8.1. For evaluation purposes, participants were randomly assigned to a treatment group or a control group. Based upon prior analysis and the opinions of WDB staff, those in the treatment group with low employability scores were assigned to Goodwill, those in the middle group were referred to Youth Opportunities Unlimited (YOU), and those in the high employability group were

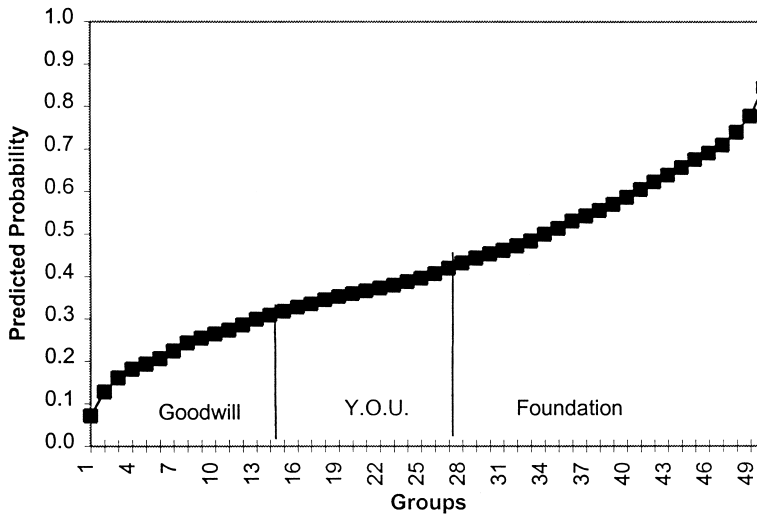


Figure 8.1 Referral of Participants to Providers Based on Employability Scores

assigned to the Behavioral Foundation. The assignment of participants in the control group will be discussed in the next section.

EVALUATION OF THE KALAMAZOO/ST. JOSEPH WORK FIRST PROFILING PILOT

Design of the Evaluation

The Kalamazoo/St. Joseph Work First profiling pilot was evaluated using a random assignment approach. The evaluation included participants who entered the program from March 1998 to March 2000. During the two-year period, nearly 3,600 welfare recipients who were single parents were assigned to the three providers serving the Kalamazoo area.⁶

The computerized intake process was designed so that welfare recipients referred to Work First from the Family Independence Agency (FIA) were randomly assigned to various groups. The random assign-

ment procedure took place in three steps. First, participants were divided into one of three groups, depending upon their employability score. Assignment of participants to the three employability groups was based on their relative ranking in the distribution of employability scores of those who enrolled in Work First at that session. It was not based on a predetermined cutoff value. Those participants with employability scores in the lowest 40 percent of the distribution were assigned to the low employability group (L), the next 20 percent were assigned to the middle group (M), and the highest 40 percent were assigned to the high group (H). Second, those within each group were randomly divided into control and treatment groups of equal size. Third, enrollees in the control group were randomly assigned to one of the three providers. Those in the treatment group were assigned to a predetermined provider that was considered to be most effective for those in each of the three employability groups. The middle group included only 20 percent of the participants because the treatment provider for that group, YOU, could accommodate only that percentage due to capacity constraints.⁷ The number of participants in each group is displayed in Table 8.5.

The primary outcome measure for the evaluation is the retention rate; that is, whether or not the participant was employed 90 consecutive days. Table 8.6 shows the retention rates of those in the control and treatment groups by employability group and provider. In this case, there is considerable variation both between groups and within groups. Note that the actual retention rate averaged for each group increases from the lowest employability group to the highest. For the control group, it increases from 11.6 percent for the lowest group to 21.7 percent for the highest employability group. The treatment group also follows the pattern of increasing retention rates from low to high employability groups. The same monotonic increase is exhibited for each provider except YOU. However, as shown in Table 8.7, the upper and lower bounds of the 95 percent confidence intervals overlap across the various groups.⁸

Retention Rates by Various Combinations of Providers

In order to determine whether different combinations of assignments of employability groups to service providers yield different out-

Table 8.5 Number of Participants Assigned to Each Provider

Provider	Employability group							
	Low		Middle		High		Total	
	Contr.	Treat.	Contr.	Treat.	Contr.	Treat.	Contr.	Treat.
Goodwill	144	402	73		164		381	402
Foundation	177		83		211	402	471	402
YOU	59		26	194	54		140	194
Total	380	402	183	194	429	402	992	998

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1998–2000.

Table 8.6 Retention Rates, by Provider and Employability Group (%)

Provider	Low		Middle		High	
	Contr.	Treat.	Contr.	Treat.	Contr.	Treat.
Goodwill	15.3	15.4	21.9		22.6	
Foundation	7.9		14.5		22.3	23.4
YOU	13.6		37.0	17.0	16.7	
Average	11.6		20.8		21.7	

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

comes, we examined six combinations.⁹ The effects of the various combinations are measured by computing the number of participants within each employability group who retained their jobs if everyone in that group received services from the same provider. To illustrate this approach, consider the first combination listed in Table 8.8. The designation “gyk” refers to the combination in which all participants in the low employability group (the left-most group in Table 8.6 is hypothetically assigned to Goodwill [g]; all participants in the middle employability group are assigned to YOU [y]; and all participants in the high employability group are assigned to Behavioral Foundation [k]). Since participants in the control group were randomly assigned

Table 8.7 Upper and Lower Bounds of the 95 Percent Confidence Intervals for the Retention Rates of Each Provider (%)

Provider	Employability group								
	Low			Middle			High		
	Lower	Mean	Upper	Lower	Mean	Upper	Lower	Mean	Upper
Control group									
Goodwill	9.4	15.3	21.2	12.4	21.9	31.4	16.2	22.6	29
Foundation	3.9	7.9	11.9	6.9	14.5	22.1	16.7	22.3	27.9
YOU	4.9	13.6	22.3	18.8	37.0	55.2	6.8	16.7	26.6
Treatment group	11.9	15.4	18.9	11.7	17.0	22.3	19.3	23.4	27.5

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

Table 8.8 Number of Participants Employed 90 Consecutive Days by Combination of Providers

Combination of providers	Employability group			Total	Ranking
	Low	Middle	High		
1 gyk	58	68	96	222	1
2 gky	58	26	72	156	5
3 ygk	52	40	96	188	3
4 ykg	52	26	97	175	4
5 kyg	30	68	97	195	2
6 kgy	30	40	72	142	6

NOTE: Providers are designated as letters: “g” = Goodwill; “k” = Foundation; and “y” = YOU. The combination “gyk” refers to the low employability group assigned to Goodwill, the middle employability group to YOU, and the high employability group to the Foundation.

SOURCE: Author’s calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

to each of the providers within each of the three employability groups, using the subgroup assigned to a particular subcontractor to represent the effects for everyone in that employability group is a sound approach.

Using this approach, the appropriate retention rate for each employability group is multiplied by the total number of participants in the control group to compute the number of participants within that group who retained their job for 90 consecutive days. For instance, for the first combination, the retention rate of 0.153 for Goodwill is multiplied by 380, the size of the control for the low employment group (see Table 8.5). This yields 58, which indicates that 58 participants in the control group of the low employability group would have retained their jobs if all were assigned to Goodwill. The same calculation is performed for the middle group, multiplying 0.370 by 183, which yields 68, and for the high group, multiplying 0.223 by 429, which yields 96. Summing these three numbers yields the total number of participants in the three control groups who retained their jobs, 222. Dividing by the total number of participants in the control groups results in the hypothetical retention rate if the combination “gyk” were used to assign participants.

Performing these calculations for all six combinations provides a convenient measure of the effectiveness of the various combinations. As shown in Table 8.8, the number of retentions ranges from a high of 222 for the combination “gyk” to a low of 142 for “kgy.” The difference between the highest and lowest is 80 retentions, or 56 percent. The difference between the highest number and the average is 47, or 27 percent. The results indicate that using the statistical tool to assess and refer Work First participants can increase the effectiveness of the program without increasing cost. The optimal combination of providers “gyk” yields a 27 percent higher retention rate than if the participants were randomly assigned to the providers.

Differences between any of the various pairs of combinations are statistically significant at the 95 percent significance level. Table 8.9 displays the difference in the retention rates and the *t*-statistics for each pair of combinations. For instance, the difference between the retention rate for combination “gyk” and for combination “gky” is 0.066 (e.g., $65 \div 992$). The *t*-statistic for this pair is 5.26, which is much greater than the critical value of 1.96 for a 95 percent significance level. Note that 10 out of the possible 15 pairs are statistically significant. Only those with differences in the retention rates of less than 2 percentage points (approximately 20 participants out of 992) are not statistically significant.

Based upon the analysis of the effectiveness of the combinations of providers, it appears that Goodwill had a comparative advantage in serving low employability participants, YOU in serving middle employability participants, and Behavioral Foundation in serving high employability customers. This combination of assignments was the same as the treatment group, which was determined by staff knowledge of the approaches taken by each provider and an analysis of welfare recipients who had participated in the program before the pilot began. However, it is beyond the scope of the pilot to determine the specific aspects of each provider’s approach that led to this outcome.¹⁰

Benefit/Cost Analysis of the Statistical Assessment and Referral System¹¹

The benefits of using the statistical assessment and referral system can be quantified by taking into account the earnings received by those

Table 8.9 Differences in Retention Rates between Pairs of Combinations of Providers

Providers		1	2	3	4	5	6
Differences in retention rates							
1	gyk	—	0.066	0.034	0.046	0.026	0.080
2	gky		—	-0.031	-0.019	-0.039	0.014
3	ygk			—	0.012	-0.008	0.045
4	ykg				—	-0.020	0.033
5	kyg					—	0.053
6	kgy						—
<i>t</i> -Statistics of difference in retention rates							
1	gyk	—	5.260	2.671	3.654	2.028	6.487
2	gky		—	-2.603	-1.618	-3.245	1.244
3	ygk			—	0.986	-0.644	3.842
4	ykg				—	-1.630	2.860
5	kyg					—	4.481
6	kgy						—

NOTE: Standard deviation derived according to the following formula:

$$\sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

where $\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$; $\hat{q} = 1 - \hat{p}$; and x_1 and x_2 are the number of successes in the samples of size n_1 and n_2 .

SOURCE: Author's calculations of Kalamazoo/St. Joseph Work First administrative data, 1996–1997.

additional participants who retained their jobs. As shown in the previous section, the optimal assignment rule yielded a net increase of 47 participants who retained their jobs 90 consecutive days over the number retaining their jobs in the group created by random assignment. Consequently, the net effect of the statistical assessment and referral system is computed by considering the difference in retention rates and earnings of the two groups. A benefit-to-cost ratio is then calculated by dividing the net effect by the cost of the pilot.¹²

The earnings are comprised of two components: the number of participants who retained their jobs (R) and the average weekly earnings of each participant in that group during the 90 days (calculated here as 13 weeks) of employment (E). As shown in Table 8.10, the average weekly earnings of those in the optimal assignment group (referred to as the treatment group and denoted by subscript T in this section) is \$192 and of those in the randomly assigned group (the control group denoted by subscript C) is \$195. The difference in earnings of the two groups ($B_T - B_C$) can be decomposed in the following way, using the control group as the base of comparison:

$$B_T - B_C = [(R_T - R_C)E_C] + [(E_T - E_C)R_C] + [(R_T - R_C)(E_T - E_C)]$$

This decomposition yields the net effect in terms of additional earnings to program participants as a result of the statistical assessment and referral system. It is assumed here that the earnings difference continues for eight quarters, with two possible scenarios considered. The first scenario assumes that the difference in the number of participants retaining their jobs for 90 days persists throughout the 8 quarters. The

Table 8.10 Average Weekly Earnings by Different Combinations of Providers

Combination of providers	Average weekly earnings (\$)
gyk (treatment group)	192
gky	211
ygk	181
ykg	175
kyg	165
kyg	189
Randomly assigned (control group)	195

NOTE: Providers are designated by letters: “g” Goodwill; “k” Foundation; and “y” YOU. The combination “gyk” refers to the low employability group assigned to Goodwill, the middle employability group to YOU, and the high employability group to Foundation.

second scenario assumes that the difference in job retention narrows throughout the eight-quarter period until the two series are equal. In both scenarios, wages are assumed to grow by 3 percent per year, and a 10 percent annual discount rate is used when computing the net present value of the earnings streams. As shown in Table 8.11, under the first scenario, the net present value of the difference in the earnings streams of the treatment and control groups is \$840,827; under the second scenario, it is \$471,054.

The additional costs incurred to develop and operate the statistical assessment and referral system for the two-year life of the pilot totaled

Table 8.11 Difference in Earnings between Treatment and Control Groups and Benefit-to-Cost Ratio of the System

Quarters after leaving program	Treatment group earnings minus control group earnings (\$)	
	No narrowing of earnings gap	Narrowing of earnings gap
1	112,179	112,179
2	113,666	98,706
3	115,165	85,073
4	116,675	71,279
5	118,197	57,321
6	119,730	43,197
7	121,274	28,906
8	122,830	14,445
Net present value (\$)	840,827	471,054
Program cost (\$)	145,000	145,000
Benefit-to-cost ratio	5.8	3.3

NOTE: The first column of earnings assumes that the retention rates remain the same throughout the eight-quarter period while the average weekly earnings converge. The second column of earnings assumes that they converge until they are equal in the ninth quarter. Wages are assumed to increase 3 percent per year, and a 10 percent discount rate is assumed for the net present value calculation.

\$145,000. This expense included designing and integrating the system into the existing Work First program, which cost roughly \$105,000, and hiring a part-time person to administer the system during the intake and orientation process, which amounted to another \$40,000 during the two-year period. Dividing the net present value for each scenario by the program costs of \$145,000 yields a benefit-to-cost ratio for the first scenario of 5.8 and a ratio for the second scenario of 3.3.

CONCLUSION

The purpose of the Work First pilot was to determine the benefits of using a statistical assessment tool to target employment services to meet the needs of Work First participants more effectively. The statistical assessment tool estimated the probability that a participant would be employed for 90 consecutive days by relating this outcome to the personal characteristics and work history of former Work First participants. Estimates were based on administrative records of welfare recipients who had participated in the Work First program prior to the time of the pilot.

The evaluation yielded the following results. First, the statistical model exhibited sufficient precision to distinguish among participants according to their likelihood of working 90 consecutive days. Second, there was considerable variation in the retention rates among the various combinations of providers offering services to participants in the three employability groups, as identified by the assessment tool. The retention rate of the combination of providers that yielded the highest rate was 56 percent higher than the combination yielding the lowest rate, and 27 percent higher than if the participants were randomly assigned to providers. Third, the benefit-to-cost ratio of the pilot project ranged from 3.3 to 5.8, depending on the assumptions regarding the persistence over time of the earnings differences between the treatment and control groups.

The results of the Kalamazoo/St. Joseph Work First pilot provide evidence that the statistical assessment and referral system can be successful in identifying needs and in targeting services to help meet the needs of customers in finding jobs. By using the system developed for

the pilot, more Work First participants can have successful outcomes without increasing the cost of the program. The pilot opens the possibility for statistical tools to be used to help improve the effectiveness and efficiency of other employment programs and service delivery systems.

Notes

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1. For example, Gueron and Pauly (1991), from their evaluations of welfare-to-work demonstrations, suggest that increased service intensity improves employment rates of clients and that spreading resources too thinly reduces program effectiveness. In addition, the evaluation of programs such as California GAINS (Freedman et al. 1996) suggests the importance of assessment in getting welfare recipients into jobs.
2. Allowable work activities include 1) unsubsidized employment; 2) subsidized private sector employment; 3) subsidized public sector employment; 4) on-the-job training; 5) job search and job readiness training and activities up to six weeks; 6) community service programs; and 7) no more than 12 months of vocational educational training.
3. Individuals can and do enroll in Work First several times. However, only about 8 percent of those who enrolled during 1996 enrolled more than once. We included each enrollee only once in the sample and included their latest appearance so that we could use any previous history in the analysis.
4. These results are consistent with previous studies that examine employment prospects of welfare recipients. Estimates based on the national SIPP survey found that education and prior employment history were important determinants of the likelihood of leaving welfare for employment (see Eberts 1997, Appendix). A study for the state of Texas also found these factors to be important (Schexnayder, King, and Olson 1991). The Texas study also found that the number of children, the age of the welfare recipient, the duration on welfare, and the use of the employment service and participation in job-training programs also affected the likelihood of employment in the expected direction. The employment- and training-related results from Texas are consistent with our results from Work First that prior employment and compliance with previous Work First enrollment positively affect the likelihood of qualified employment.
5. Several criteria can be used to judge the ability of the model to distinguish among

Work First participants as to their likelihood of finding employment. Two measures are considered here: 1) the relative steepness of the distribution of each individual's employment probabilities, and 2) the width of the confidence intervals. The model satisfies both criteria, as described in Eberts (2002).

6. About half of the participants went through the program at least twice. For purposes of the evaluation, we included only the last time the person appeared in the program, if they appeared more than once. We adopted this approach to avoid biasing the evaluation toward multiple enrollees. One could argue that including the same person more than once in the evaluation overweights that person's experience relative to those who entered the program only once. More will be said about this approach in a subsequent section.
7. The actual assignment of employability scores was slightly different from the way in which the statistical assessment model was originally estimated. The model was estimated based on the entire set of individuals who participated in and completed the program during a year's time. The computation of the employability score, based on the coefficients from the model, was done at each intake and orientation session. These sessions took place twice a week. Obviously, only a small number of people who participated in the program each year attended each session.

Because of the small number of participants at each session, it may be the case that individuals in attendance on any given day were not fully representative of the Work First population. In examining the distribution of employability scores for each session, we found that on some days the employability scores would cluster on the high side, while on other days they would center on the low side of the distribution. Since the cutoffs were determined by dividing the distribution of scores of individuals who showed up on a given day, it could be the case that individuals with lower-than-average employability scores were assigned to the "high" employability group, while on another day individuals with higher-than-average employability scores were assigned to the "low" employability group. It depends upon who was referred to a particular session.

Another difference between the employability scores as originally estimated and those assigned to participants during the pilot was the magnitude of the score. We recognized that the employability scores declined over the year in which the statistical assessment model was estimated. This relationship was consistent with the general observation by the WDB staff that as an increasing number of Work First participants found jobs, those remaining would have lower skills and be harder to place into jobs. To account for this trend, we included in the model the date that the participant enrolled in the program. The coefficient on this variable (addate), as shown in Table 8.4, was relatively large and highly statistically significant. The value of the coefficient (-0.003) was large relative to the mean of the variable (approximately 14,460, which is the date expressed in machine language).

However, it turns out that as time increased from the date in which the model was estimated to when it was used to assign the employability scores, the coefficient played a much larger role in determining the size of the predicted value.

The mean value of the employability score fell from about 0.30 in the original model to 0.05 in the evaluation. Most of the difference is due to the more advanced date. When the date is rolled back to its average value during the period in which the model was estimated, the mean employability score for the sample used in the evaluation increases to 0.46.

Further investigation shows that the rank ordering of employability scores computed with and without the adjustment for the time is highly correlated. The correlation coefficient of the actual employability score assigned to participants during the evaluation and the hypothetical one when the date of enrollment is rolled back by two years is 0.82.

8. The overlap is not as great between the low and middle employability groups as it is between the middle and high groups. The difference in the average retention rates for the low and middle employability groups is statistically significant at the 95 percent significance level. On the other hand, the difference in the average retention rates for the middle and high employability groups is not.
9. More than six combinations are possible with three providers and three groups by assigning more than one employability group to a provider. However, we adhered to the WDB's contractual arrangement during the pilot that all three providers delivered services. Therefore, we eliminated from consideration combinations that assigned two or three groups to one service provider.
10. As previously noted, the retention rate for those in the middle employability control group assigned to YOU is higher than the rate for the treatment group assigned to YOU. If, as intended, individuals were randomly assigned to the treatment and control groups, and those within the control group were randomly assigned to the providers, one would expect the two retention rates to be similar. We tried two alternative approaches of deriving retention estimates for the different combinations that may mitigate the problem. The first approach controlled for factors that could be responsible for the significant difference between the treatment and control groups assigned to a specific provider. One possible factor is the date on which participants enter the program. It could be the case that because of the small number enrolled during each session and the nonrandom nature of referrals from FIA, the time of enrollment may lead to these differences. The second method combined the outcomes of both the control and the treatment groups. In this way, we reduced the effect of the timing of enrollment by considering outcomes from both groups. Both approaches yield results that are similar to the original approach.
11. I thank Kevin Hollenbeck and Jeff Smith for suggestions and guidance on conducting the benefit/cost analysis.
12. The social value of the new system may be less than the value computed here because of displacement effects among the welfare population. It is conceivable that the additional retention by participants of the program with the new system may displace other welfare recipients from their existing jobs or preclude new Work First participants from finding jobs since the additional retentions reduce the job vacancies.

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