

The HealthLink Wellness: Science for the Individual

Executive Summary

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Link to:

HealthLink Program

Screening Statistical Results

Wellness Comorbidity Matrix

Improvement in Risk Profile Index

Appendix - Progress Report

<https://AuditmetricsAI.com/filelibrary/hlprofile.xlsx>

HealthLink Program

The goal of HealthLink is to initiate a process of prevention and early detection that will become a model for expansion into other community settings. The hope is to create a community health culture that revolves around three principles:

- **Education:** Setting up comprehensive approaches to retiree health education.
- **Retiree Health Programs:** Reduce retiree risks; engage a large proportion of retirees in health monitoring with feedback and other health-promotion activities.
- **Partnerships:** Develop an extensive network of partnerships that engages the retirees in the fabric of the community. For example outreach from this project has in the past lead to networking with existing senior citizen programs throughout Rhode Island and southern New England.

The initial support of the Rhode Island AFL/CIO was critical in the acceptance of HealthLink by labor retirees and their local chapter leadership. With this base of support, HealthLink went on to

established six regional screening centers in Rhode Island which are listed below. In addition to Rhode Island, there is also one screening center in Worcester Massachusetts but limited only to members of Teamsters Local 170 Retirees Chapter. Local 170 retirees have been very vocal supporters of the HealthLink approach and with the approval of the Center for Disease Control it was decided to include them in the HealthLink Project which was originally targeted for Rhode Island

HealthLink's Regional Centers:

- **Providence RI – United Commercial and Food Workers local 328 Union Hall**
- **Cranston RI – VFW Post 2812**
- **Warwick RI – BPO Elk's Lodge 2196**
- **Smithfield RI – BPO Elk's Lodge 2359**
- **East Providence RI – Teamster Local 251 Union Hall**
- **North Providence RI – St. Anthony's Church Hall**
- **Worcester MA - Teamsters Local 170 Union Hall**

HealthLink's wellness approach is designed for seniors based on their participation in regular medical screenings and feedback. The specific measures screened were: fasting blood glucose, blood pressure, high-density lipoproteins (HDL), total cholesterol (TC), smoking habits and body mass index (BMI). Four separate screening sessions were held at six Rhode Island regional centers and one in Massachusetts. The first screening was conducted in October 2002 and the last in June 2004. The intervention between screenings was feedback to retirees about their results and the recommended screening values they should try to achieve. Many retirees were encouraged and did share the results of their screening sessions with their primary care physician for further follow-up. After assessing the results of the initial baseline screenings, workshops and other health education tools were developed to augment the medical screening and feedback program.

The pilot HealthLink Project had completed its final screening as of June 2004. The goal was to schedule screenings and follow-up long enough to determine whether any measured improvement in HealthLink members' screenings are in fact merely transitional due to the newness of the project or evidence of sustainable progress. Many studies have shown that any new initiative may have immediate impact driven by the newness of the experience but in the long term initial gains can recede into the background.

All four screening results indicate that HealthLink improvements are indeed sustainable. Results indicate that HealthLink's initial gains were upheld at the fourth and final screening. In some cases there is statistical evidence of additional modest improvements at the fourth and final screening. The significance of the fourth screening is that there is no evidence of backsliding. Sustained member support is evidenced by the fact that almost 70% of all eligible HealthLink members reported for at least 3 of the four scheduled screenings.

Retiree Input In any intervention and follow-up project there are always those individuals who for what ever reason cannot make all the scheduled follow-up sessions. For HealthLink this was

compounded by the fact that though we started with a cohort of 523 individuals who formally signed up for the wellness intervention and screening program, we did not close off enrollment once the screenings and interventions began in 2002. We found that members would call to inquire or just show up at a screening session requesting a neighbor or friend also join the HealthLink program. An additional 102 individuals took advantage of this on-going enrollment so that by the last series of screenings the total enrollment for the screening interventions grew to 625 individuals.

This did pose analytical issues for our statisticians but it was felt more important for HealthLink members, who took the time to promote the program to their fellow retirees, be heard and given a sense that their input is truly appreciated. The results break down the screenings based on each individual's screening schedule and not the calendar date of the screening. For example if an individual enrolled or only showed up in time for the 2nd scheduled screening in April 2003, that screening is considered that individual's 1st baseline entry screening. Eighty percent of the new add on members enrolled during the first or second scheduled screenings.

Screening Statistical Results

Listed below are the results of all screenings. Table 1 lists fasting blood glucose levels for all four screenings. As the table points out, most progress was between baseline and the second screening. Immediate feedback for those with elevated measures is handled at the screening session and for those whose blood glucose was not in control, follow-up phone calls were made to assure that the member was acting on their medical condition. This was true for all the screening results

1. Glucose Level*				
	Screen #1	Screen #2	Screen #3	Screen #4
Normal (<=110)	51%	73%	78%	77%
Pre-Diabetes (111124)	23%	13%	10%	10%
Diabetes (>= 125)	26%	15%	12%	13%
Total	100%	100%	100%	100%
*P< .01				

Table 2 below examines total cholesterol with the most immediate results seen after the first screening but steady progress right through to the last screening.

2. Total Cholesterol*				
	Screen #1	Screen #2	Screen #3	Screen #4
Normal (<200)	48%	60%	65%	71%
Above Avg. (200-239)	36%	30%	29%	26%
Elevated (>240)	16%	10%	5%	3%
Total	100%	100%	100%	100%
*P< .01				

Blood pressure is a major public health problem in the United States and though we have made progress, much more needs to be done. One of the key components for the improvement so far is our initiation of walking clubs and workshops on the DASH (Dietary Approaches to Stop Hypertension) eating plan. Reducing the numbers of those with hypertension from 61% to 37% is considerable progress. Unfortunately, all too many members are in the pre-hypertension range. In future planning for HealthLink more thought should be given to exercise programs.

3. Blood Pressure*				
	Screen #1	Screen #2	Screen #3	Screen #4
Normal	6%	7%	13%	14%
Pre-Hypertension	33%	32%	47%	49%
Hypertension	61%	61%	40%	37%
Total	100%	100%	100%	100%
*P<.01				

HealthLink analysts have developed a composite score of risk for coronary heart disease. It is based on risk factors as defined by the Framingham Heart Study. The HealthLink Risk Profile (HRP) index is a composite of all the screening measures for a given individual and based on an individual's screenings, one can be classified as indicated in the first column of table 4. Those who are in the elevated categories (HRP 2-4) are immediately encouraged to follow-up with us or, in some instances, their primary care physician. When a wellness workshop is scheduled these individuals also receive a follow-up phone call to encourage their participation. The results to date have been very encouraging. The number of individuals whose risk is normal improved from 18% at screening #1 to 36% at screening #4. The more important risk reduction is for those in the elevated ranges (HRP 2-4), which reduced from 41% to 27%. These individuals have one or more screening results that are of immediate concern.

4. HealthLink Risk Profile*				
	Screen #1	Screen #2	Screen #3	Screen #4
0. Average Risk	18%	21%	30%	36%
1. Above Average Risk	41%	40%	41%	37%
2. Elevated Risk	14%	13%	13%	15%
3. Elevated-Moderate	10%	12%	9%	7%
4. Elevated-Severe Risk	17%	13%	7%	5%
Total	100%	100%	100%	100%
*P< .01				

In terms of the aggregate risk reduction, statistically the greatest improvement occurred between the 2nd and 3rd screenings. This coincides with the major shift observed in improvement of blood pressure results. This was also the time when the DASH eating plan and walking clubs were introduced, specifically to make inroads in hypertension results.

Wellness Comorbidity Matrix

In addition to the risk profile index, we added an additional monitoring tool, the Wellness-Comorbidity Matrix (WCM). It is an empirically derived two-dimensional matrix that provides a comprehensive picture of each individual's self-reported morbidity of disease and prescription of drug therapeutics. The matrix starts from a cell with zero self-reported disease and drug therapies in an upper left. The matrix is then filled in with individuals at the lower right cell indicating individuals with maximum number of chronic conditions reported and prescribed.

The structure of the Matrix was designed in conjunction with our risk profile. They are the products of our community program of health fairs where we monitored BMI, hypertension and blood screenings. At the health fairs we ask participants if they were being monitored by their healthcare provider for **1.** hypertension, **2.** diabetes and **3.** elevated cholesterol. We also inquired if they are also being prescribed drugs for those three conditions.

Table 1- Structure of the Matrix:

		Number Conditions Prescribed			
		0	1	2	3
Number Conditions Diagnosed	0				No Condition
	1				One Condition
	2				Comorbidity Range
	3				

In the upper left cell are those individuals who are not being monitored by their primary care physician for hypertension, diabetes and elevated cholesterol. The lower right cell are those individuals who are monitored and prescribed drugs for all three conditions.

The task is to build the relevant data needed to fill in those cells so one can have guideposts in setting targets for improvement

The body mass index (BMI) is a good starting point in assessing an individual's potential for managing their own chronic disease. Although it is not an input to the American College of Cardiology / American Heart Association risk formula it has been well documented that its management is critical in preventing chronic diseases. During our health fairs we asked participants if they are being monitored for hypertension, diabetes and elevated cholesterol. We also inquired if they were also being prescribed drugs for those three conditions. In Table 1, we break down BMI by the three conditions we queried (hypertension, diabetes, and elevated cholesterol) and the number of conditions actually being prescribed medication.

Table-2 Average Body Mass Index by Conditions Diagnosed and Number Prescribed

Target Level=25							
		Number Conditions Prescribed					
		0	1	2	3	n	%
Number Conditions Diagnosed	0	26				186	12.9
	1	27	28			530	36.8
	2	29	30	31		534	37.1
	3		29	30	34	190	13.2

The top left-most table value is the average BMI of participants who self-reported none of the three conditions being monitored; consequently, none were prescribed drugs. The bottom right-most value is the average BMI of individuals who reported being monitored for all 3 conditions and at

the same time are prescribed drugs for all 3 conditions. Between these extremes are various combinations of number diagnosed and number prescribed. Approximately 74% of HealthLink Wellness members were around the comorbidity border.

The distribution in Table 1 indicates over weight and obesity are uniform risk factor for all participants. Those above the comorbidity range have a good chance to move their average BMI into the normal weight BMI category of ≤ 25 kg/m². For participants who are in the shaded area of comorbidity, inroads in moving them from overweight and obese is progressively more difficult. The bottom right-most cell with the highest average BMI has the farthest to improve. Once BMI gets close to the 35-40 range, it is considered moving into morbid obesity.

Over several years, we have been able to make inroads in some elements of this risk factor, but BMI is the most difficult in making sustained progress. We have documented individuals who made admirable weight improvement. However, real progress must include primary care physicians in developing strategies in reducing obesity and its consequences.

Our strategy has been to reduce health risks on several fronts. We used another risk estimator to guide our health education message and to target individuals for follow-up. For example, we used our cardiac health risk probability RPI as another risk estimator.

With the help of a panel of statisticians from Boston University and our physicians we translated relative risk into a series of categories of health status that can be broken down into stages targeted for improvement or as we called it “Ladder of Success”.

Table 3 – Risk Profile Number Conditions Diagnosed by Number Prescribed.
Target Value = 1

Number Conditions Diagnosed	Number Conditions Prescribed			
	0	1	2	3
0	1.44			
1	1.73	1.5		
2	1.62	2.13	1.96	
3		2.08	2.4	3.18

If an individual’s screening inputs are ideal, then the target value of 1 would be obtained. The highest ratio in this grid is the bottom right-most value, with the average observed RPI being 3.18 times higher than the ideal screening input of 1. The bottom row reflects relative risks that are in the “Elevated Moderate” and “Elevated Severe” categories that require ongoing monitoring care and follow-up. This pattern has the same pattern of progressive increase in risk shown in Table 1 for BMI, which is a well-documented risk factor for chronic diseases. The segmentation of the RPI indicates our clinicians and statisticians did a good job in matching RPI and BMI patterns. The value of RPI is we could advise reasonable incremental steps for improvement. Once that first hurdle is achieved, a self-reinforcing form of positive reinforcement can kick in leading to sustainable improvement over time.

Is age a factor? We expect that the elderly subpopulation would show an overall higher risk ratio than the general adult population because that subpopulation has the highest morbidity of chronic disease. This has a bearing on where we will target risk ratios for future follow-up with the primary care physician. For this discussion, we are looking at a total pattern of risk. In the ACC/AHA original risk calculation of 10-year risk probability, age is an input variable, but in calculating our RPI, age is held constant because it involves observed and ideal for the same person. Each individual is in effect their own control.

Therefore, age was not a factor in Table 2 variation. In fact, the age of those included in the bottom right—highest risk group was on average 1 year younger (74.8 years) than those included in the top left—lowest risk cell (75.9 years). In improving this latter pattern of risk ratios, a sustained partnership with the physician is vital.

Targeting based on the overall risk ratios of Table 2 is important, but we must also look further into the details and broaden the base of analysis. Participants of our health fairs generate three copies of their results; one for their own records, one for our monitoring purposes, and one for their primary care physician. The last copy is a critical link in the wellness process. A physician feedback loop helps in refining and communicating the details of the screenings and in coordinating physician/community support.

There are particulars of the ratios that can be communicated to the physician and patient. For example, a key input in the ACC/AHA model is systolic blood pressure. Below systolic blood pressure is broken down into the matrix.

Table 4 Systolic Blood Pressure by Conditions Diagnosed and Prescribed
Target =120 mmHg

Number Conditions Diagnosed	Number Conditions Prescribed			
	0	1	2	3
0	126			
1	129	123		
2	138	137	136	
3		124	134	133

With this pattern, one has to take into consideration that some individuals are currently being prescribed drugs for hypertension. Our goal is targeting, but it is up to the physician to work out the details for each case, a mutual effort to shift SBP in the direction of the ACC/AHA ideal value. Ideal guideline are age dependent and if blood pressure is already controlled by drug therapy, then the decision for an additional dose has to take into consideration the possibility of increasing cost with a diminishing net benefit. This is a different dynamic than that for an initial implementation of drug therapy. These specific decisions are best left to the discretion of the physician, who has to consider not only a patient's total pattern of risk, but also integrate risk with a patient's personal and family medical history. As in any clinical decision, context will continue to have a role in a physician's decision-making process.

Diabetes is a key input component of the ACC/AHA cardiovascular risk model. It does not use blood glucose as a specific input variable, but we used blood glucose as a surrogate for diabetes. Table 4 shows a breakdown of fasting blood glucose:

**Table 5 Fasting Blood Glucose by Conditions Diagnosed and Prescribed
Target 125**

		Number Conditions Prescribed			
		0	1	2	3
Number Conditions Diagnosed	0	95			
	1	99	97		
	2	106	112	102	
	3		155	150	159

Once again, as with blood pressure, we have to take into account that some individuals are being prescribed drugs specifically for diabetes to control blood glucose. However, it seems clear that those in the bottom row exhibit high fasting blood glucose that warrants additional attention, with their physician to specific therapy options. Our role in education and support is also paramount.

**Table 6 Total Cholesterol by Conditions Diagnosed and Prescribed
Target =170 mg/dl**

		Number Conditions Prescribed			
		0	1	2	3
Number Conditions Diagnosed	0	219			
	1	216	176		
	2	199	187	156	
	3		189	165	147

The interesting pattern in Table 5 is that the values in the lower right portion achieves the guideline ideal target of 170 mg/dl. It can be interpreted that statins and other cholesterol therapeutics are contributing to this beneficial shift. This is usually the high-risk portion of the risk matrix, with at least 2 conditions monitored with 2 or 3 being prescribed drug therapy. Should the values not reaching the ideal TC level be targeted? Once again, that should be determined via the individual doctor/patient relationship.

Smoking is another important input; however, for this group of retirees, only 6.4% reported being smokers. When queried further, it became clear that for this population of fixed-income retirees, tobacco was much too expensive. We then asked if they were ever a regular smoker in the past and

43.4% responded affirmatively. It seems that the trend of loading taxes onto tobacco sales has had a potential beneficial public health impact.

Conclusion

We believe that the ACC/AHA cardiovascular risk assessment model is a valuable public health and personal tool. It is a useful guide in communicating risk to patient and physician and community resources. It is a tool that can enhance both clinical office and community outreach efforts provided there are strong communication links.

Our intent is not to make individual clinical decisions. What we demonstrated is that standardized risk ratios are valuable in providing markers in documenting population cardiovascular risk and where to target efforts for improvement. The ratios have the additional benefit of aiding the communication process. We can demonstrate to the individual where they are currently in their personal cardiovascular risk and a path for improvement.

Our goal is not determining when to initiate or modify specific therapies but to use the best available tools to help both doctors and patients improve their health status. In the final analysis it must be emphasized that the most important hurdle for progress is for the individual patient to internalize the slogan of our HealthLink Wellness approach, "**Taking Control**".

Improvement in Risk Profile Index

Integral to the HealthLink approach is regular medical screening and feedback. The specific measures screened are: fasting blood glucose, blood pressure, high-density lipoproteins (HDL), total cholesterol (TC), smoking habits and body mass index (BMI). Screenings started in 2001 at a health fair, then the phase of 2002 to 2004 with multiple screenings reported to the CDC and the most recent was held in October of 2010. At each screening feedback was provided to retirees about their results and the recommended screening values they should try to achieve. Many retirees were encouraged and did share the results of their screening sessions with their primary care physician.

Concurrent with the development of the medical screening program, a series of health promotion activities has been implemented. In order to maintain an ongoing dialog with HealthLink Wellness members, a newsletter and website were implemented. The newsletter and website provide members with up-to-date health related information, healthy food recipes as well as updates on HealthLink activities.

Walking Clubs were started at 3 area locations, (Lincoln and Warwick mall, East Providence Senior Center Walking Path). For some individuals participating in the walking club is their first effort at physical activity. Individuals who made their own exercise plans were encouraged to report their activity. Along with the walking clubs workshops and health education sessions were implemented to provide retirees with tips on dieting and nutrition from nutritionists and other health educators and counselors.

The screening results are in themselves very informative and provide valuable feedback to the participants. How do these results compare to any national norms as it relates to possible disease

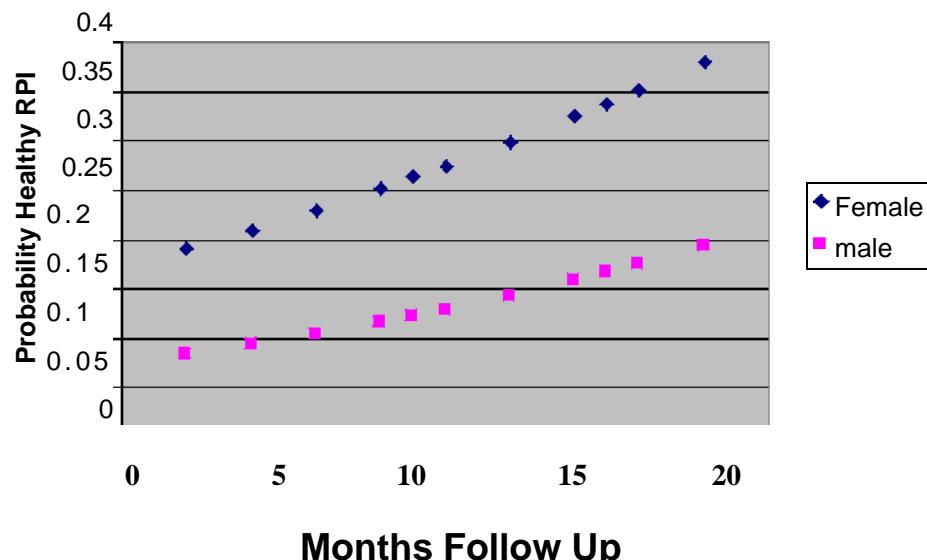
outcomes? It is imperative to examine all risk factors collectively. Recently the Framingham Heart Study (FHS) reported on the development of a statistically derived mathematical model of coronary heart disease risk. The model is derived from a population-based sample which included 2489 men and 2856 women 30 to 74 years old at the time of their Framingham Heart Study examination in 1971 to 1974. Participants attended either the

11th examination of the original Framingham cohort or the initial examination of the Framingham Offspring Study. Similar research protocols were used in each study. Persons with overt CHD at the baseline examination were excluded. The statistical tests employed included age-adjusted linear regression or logistic regression to test for trends across blood pressure, TC, LDL-C, and HDL-C categories. Age-adjusted Cox proportional hazards regression and its accompanying c statistic were used to test for the relation between the independent variables listed above and the CHD outcome and to evaluate the discriminatory ability of their prediction model. A 12-year follow-up was used in the Cox proportional hazards models, and results were adapted to provide 10-year CHD incidence estimates. It was this mathematical model that HealthLink analysts used in the period from 2002 to present measuring program performance. What was developed was a derivative screening wellness index called the Risk Profile Index (RPI).

What was developed during our two year CDC follow up study, in order to visualize the model as described, was to do a gender and age-adjusted plotting of the probability of a healthy HealthLink Risk Profile as a function of month follow-up separately for males and females using the logit function to plot a trend line. Age was adjusted to the average age of the total sample of male and female participants. Listed below is the plot for observations conducted for four-year screenings.

As the plot below indicates, for both males and females, the probability to be in the healthy risk profile category goes up as a function of months of follow-up. Follow-up period is a surrogate measure for exposure to HealthLink Wellness interventions. So, there is evidence that exposure to HealthLink Wellness interventions are what generated improvement in HealthLink results. The plotting also points out males consistently register a lower probability of recording healthy risk profile measures as compared to females at all levels of exposure. When examining gender differences in risk profile improvement, males started at 9% normal (healthy RPI) and ended at 27% normal RPI at screening #4. On the other hand females started at 25% normal RPI and by the fourth screening that number increased to 45%. Females started at a higher beginning point and exhibited a 20% improvement while males exhibited an 18% improvement.

Age/Gender Probability of Healthy Risk Profile Index



Appendix - Progress Report

John Doe

100 Main Street

HealthLink # - 0000000000

AnyTown, RI 00000

Screening Date	Systolic BP	Diastolic BP	Glucose	Fasting	Total Cholesterol	HDL	BMI	Smoker	RPI
5/20/21	140	80	101	y	189	58	27	n	1
10/22/21	132	84	100	y	178	42	29	n	1
6/25/22	134	76	96	y	220	53	30	n	1
11/13/22	140	86	98	n	227	56	32	n	2

Your current RPI average of 1.25 is above average. Let's work together to improve.

Your average BMI of 29.5 is above a reasonable starting target of 27.

1.33 is the Average RPI for all of HealthLink members in this report, how do you compare?

Risk Profile Index (RPI)

The screening tests you have participated in were selected to help you monitor your health and track your progress. HealthLink has developed an "Overall Risk" scale based on the Framingham Heart Study called RPI. It is a scale that ranges from 0 to 4 with 0 indicating that your screening results collectively are normal. It is a summary of all of your screening tests and is an indicator of your risk of heart disease and other chronic conditions.

The following RPI scores Indicate:

≤1 - All tests in normal range: Keep it up.

>1- Above normal range: Extra care on your part in diet and exercise can help but also keep in contact with your physician.

2-4 Elevated range: requires action on your part, consult with your physician

BMI

Your goal should also be to improve your BMI.

An ideal BMI would be a value under 25. A value over 25 and you are considered overweight. A score of 30 or above is considered obese. If you are in the obese range, please start right away by setting immediate targets with the ultimate goal of 25.