

Prevalence of Risk Factors for Diabetes

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Introduction

Identifying risk factors for a disease enables those exposed or predisposed to the disease to do things on a day-to-day basis for self-care, and possibly to seek medical attention. Although once a person is diagnosed with diabetes, it is generally expected that diabetes can not be cured. And once it is determined that diabetes is present, knowing other risk factors will provide indicators that complications may be developing. The difficulty with the use of the term “risk factor” is that it may be construed as a “causal” factor. In this respect one needs to distinguish between underlying causes, symptoms of diabetes, and variables that are correlated with diabetes. As an example, the Behavioral Risk Factor Surveillance survey (BRFS), it is more convenient to ask a person’s height and weight (which presumably are measures commonly known by respondents in a telephone conversation). To ask them to measure their waist and hip circumference with a tape measure would be too inconvenient. It is easier to ask someone what kind of exercise activities they are involved in rather than the calories per week expended in physical activity. In the doctor’s office it is cheaper and easier for example to measure a person’s blood glucose level than it is to measure either their blood insulin level or insulin sensitivity; consequently the predictive value excess insulin (hyperinsulinemia) is missed. Therefore, in this chapter, when the phrase “risk factor” is used, keep in mind that a particular risk factor may or may not be a causal agent; and that eliminating that risk factor will not cure diabetes and may or may not control the diabetes. For a person who does not have diabetes, eliminating a risk factor may or may not prevent or delay diabetes from appearing.

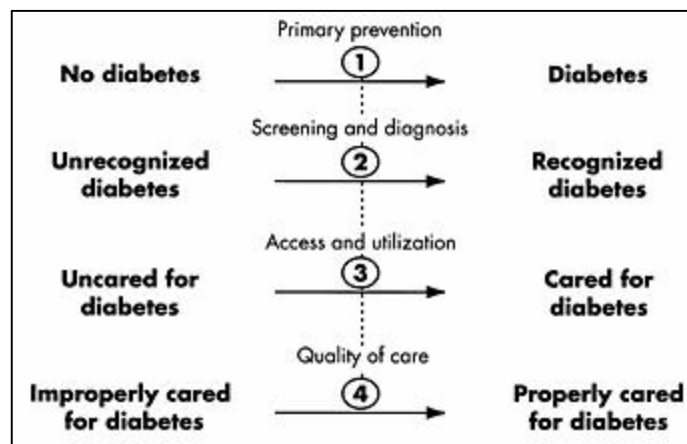
Prevention Models

The model used in this report to organize the presentation of risk factors is the three-stage prevention model:

- Primary prevention: avoiding disease occurrence
- Secondary prevention: early detection and reversal
- Tertiary: prevention or delay of complications

At each prevention stage, it is desirable to have indicators than something might indicate that either diabetes might develop; and if it develops to be able to detect it and control it.

An alternative prevention model proposed by Frank Vinicor¹ looks at the prevention efforts from a systemic approach, intended to reduce the incidence, morbidity and the mortality of diabetes. There are four aspects of this model: primary prevention, screening and diagnosis, access and utilization of health care services, and quality of care of health care services. Each of these aspects affect the transitioning of a person from



- not having diabetes, to having it;
- not knowing they have it, to being aware of their diabetes;
- not having professional care for their diabetes to having professional care;
- poor or improper professional care for their diabetes to good and proper professional care.

Each of these prevention models requires diverse data in order to describe each of their stages. Other chapters of this report address various aspects of these prevention models: Mortality and Complication chapters discuss the diseases associated with diabetes and tertiary prevention. Provider Prevention Practices address aspects of access and utilization and quality of care as well as secondary prevention.

Risk Factors for Primary Prevention

What are the risk factors that can be used by people in avoiding diabetes occurrence? The list of risk factors described by the American Diabetes Association (ADA)², Centers for Disease Control (CDC)³, and the National Institutes for Health (NIH)⁴ includes many of the following:

- Age
- Family history/ ethnicity
- Physical Inactivity
- Impaired Glucose Tolerance / High blood sugar
- Body Mass Index (BMI)
- Hypertension
- Abnormal lipid profile
- Diet / Low cereal fiber, lack of vegetables in diet
- Waist to hip ratio
- Low birth weight
- Women who gave birth to a large baby

Of these, the BRFSS is capable of determining the age, physical activity level, BMI, ethnicity (very limited in Vermont), hypertension and cholesterol status. Some dietary factors are available. Other important factors, such as family history, plasma glucose level, waist to hip ratio, low birth weight, and for women having given birth to a large baby, are not available for reporting Vermont specific results.

It is important to reiterate the difference between a causal factor and a risk factor. Having a high BMI, for example, while it is a risk factor, has not been shown to be a causal factor. However, it is an indicator that something is possibly wrong, and that those with a high BMI need to monitor the other factors related to diabetes. However, having a low BMI does not make one immune to diabetes.

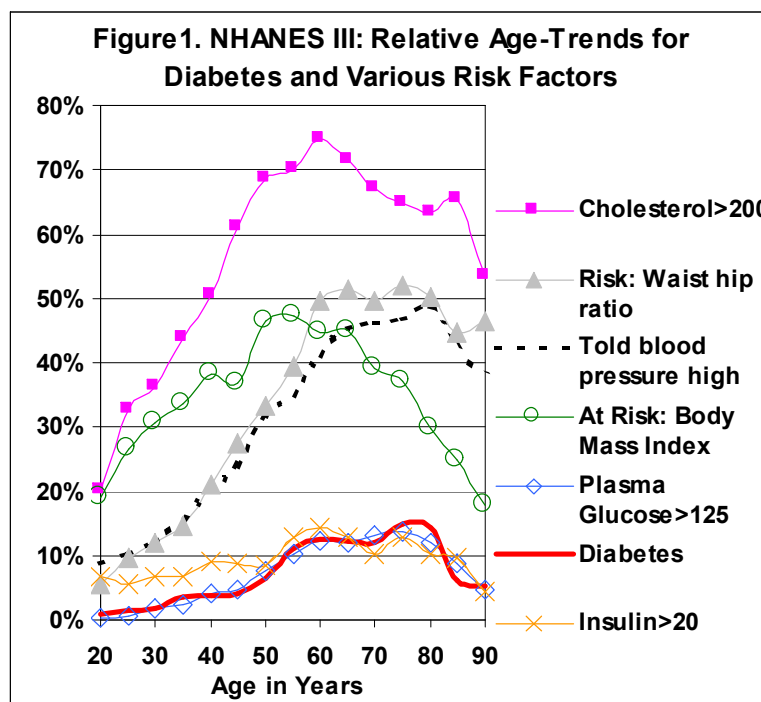
NHANES III and Risk Factors among Americans

Data from the National Health and Nutrition Examination Survey III (NHANES III - 1988-94) is available to look at diabetes risk factors among Americans. Since diabetes is diagnosed with plasma glucose tests, it is possible to look at the NHANES III to estimate the positive predictive power of various risk factors for high plasma glucose. In the table below the positive predictive power and the relative risk values are displayed. For example, being told at one point in the past that one has diabetes predicts

57.3 percent of the cases of high plasma glucose (>125 mg/dl). About 5.1 percent of the NHANES III weighted sample were measured with high plasma glucose. Having a high waist to hip ratio (WHR) predicts 18.5 percent of the high plasma glucose cases, while having a high BMI predicts 9.7 percent. Having multiple risks increases the chances of having high plasma glucose. For example, having a high WHR and reporting that one has a blood relative with diabetes

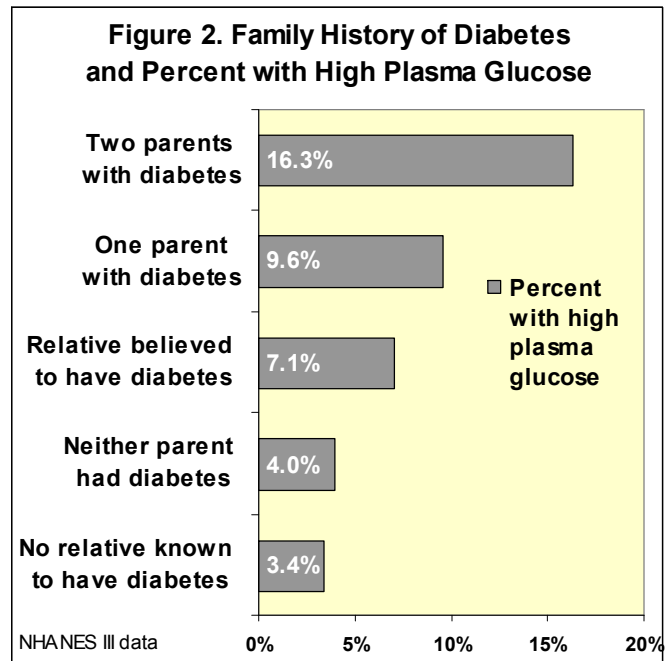
Predicting High Plasma Glucose NHANES III U.S. Data	Positive Predictive Power	Relative Risk
1 Report being diagnosed with diabetes	57.3	2.3 (2.1 - 2.5)
2 Plasma Insulin > 20	28.5	9.6 (8.6 -10.8)
3 Waist to Hip Ratio >1.1 for men or >1 for women	18.5	4.1 (3.5 - 4.9)
4 Told blood pressure is high	10.7	3.2 (2.9 - 3.6)
5 Being Older than 45	10.1	5.2 (4.5 - 6.1)
6 Body Mass Index >27.8 for men and >27.3 for women	9.7	3.6 (3.2 - 4.1)
7 Being Older than 40	8.9	6.4 (5.4 - 7.7)
8 Report relative had diabetes	7.1	2.1 (1.8 - 2.4)
9 Told cholesterol is high.	7.1	1.0 (1.0 - 1.0)
Multiple risk: 3 & 8	20.1	4.3 (3.5 - 5.3)
Multiple risk: 3 & 5 & 8	24.8	5.3 (4.3 - 6.6)
Multiple risk: 3 & 4 & 5 & 8	35.4	7.4 (5.9 - 9.3)

predicts 20.1 percent of the high plasma glucose cases. Having a high WHR, high blood pressure, being older than 45 and reporting that one has a relative with diabetes predicts 35.4 percent of the high plasma glucose cases. The relative risks of high plasma glucose for the risk factor are also listed. The risk of high plasma glucose is about 9.6 times higher for someone with high insulin than those whose insulin is in normal range. Those with the four risk factors described above are 7.4 times more likely to have high plasma glucose compared to those with none of the four risk factors.



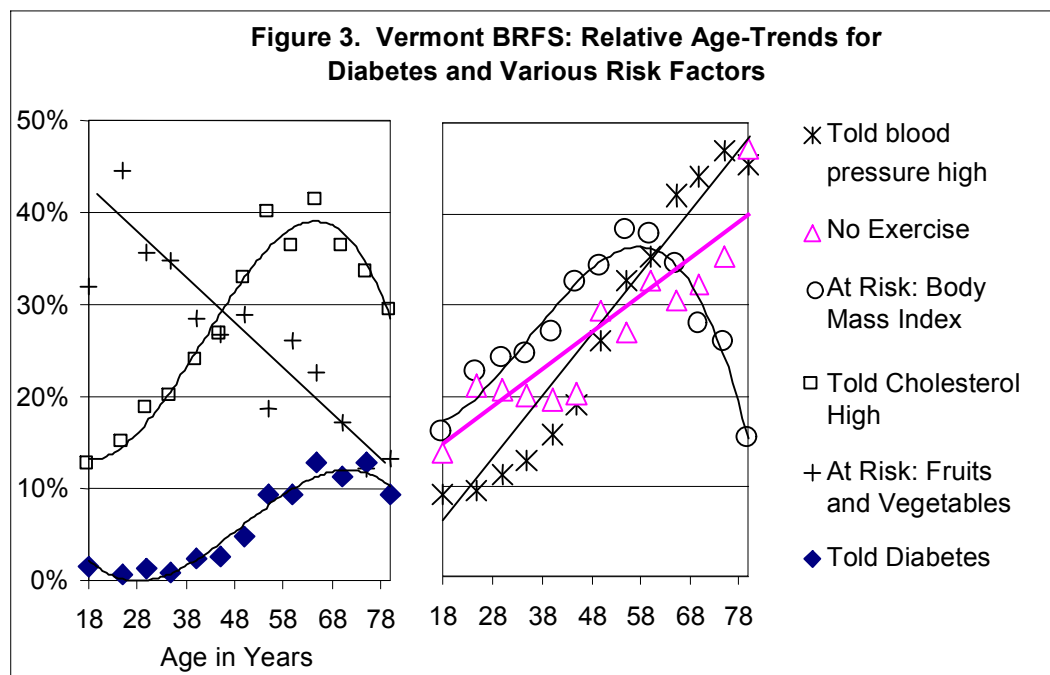
While age is an important risk factor, the risk factors themselves vary with age. Figure 1 represents a cross-sectional display of risk factors for five-year age groups. All risk factors trend upward with age, reach a peak then trend downwards.

Family history of diabetes is also an important predictor of diabetes. Among those who state that they know of no relative with high plasma glucose (≥ 126 mg/dl), the prevalence of diabetes in the NHANES III survey is 3.4 percent. This prevalence increases according to the number and genetic proximity of the relatives who have diabetes. Among those with just one parent having diabetes, 9.6 percent have diabetes; while among those with both parents having diabetes 16.3 percent have diabetes.



BRFS and Risk Factors among Vermonters

The pattern for BMI using 1994-98 BRFS data is much the same as with NHANES III, with the percent at risk because of BMI reaching a peak in the fifties. While the percentage of people who were told that they have high cholesterol is highest in the fifties and sixties years of age, high blood pressure percentage shows a continuous increase with age (with just a hint of a maximum at the highest age group). If more

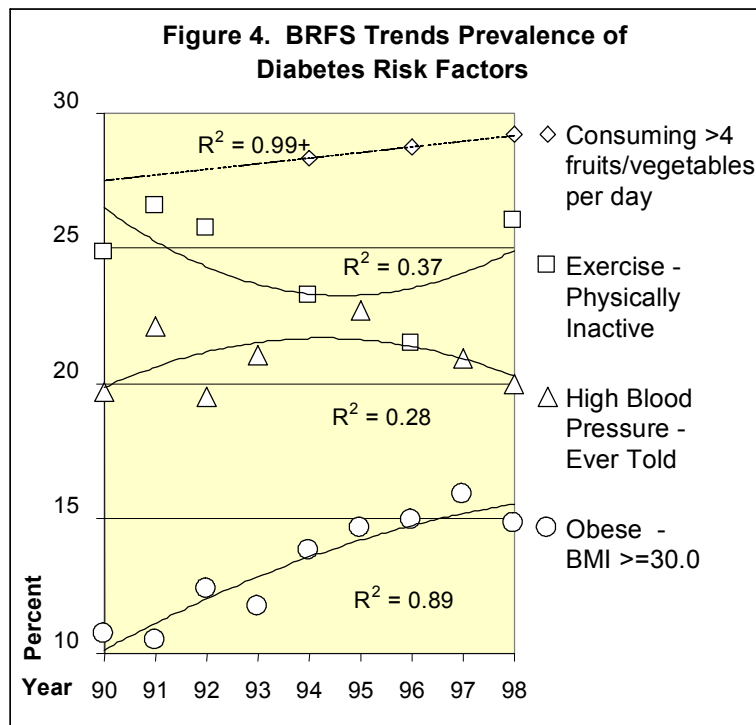


data were available, the high blood pressure peak might occur at about the same age as for NHANES III people. The percentage of people, who are not getting the recommended daily amount of fruits and vegetables, tends to decrease with age; while the percentage not exercising in the last 30 days tends to increase with age.

BRFS Item	Estimated Age at Which Percentage Peaks
Told Blood Pressure High	Linear Worsening with Age
BMI	50 - 55
Told Cholesterol High	75 - 80
Told Have Diabetes	65 - 70
No Exercise Past Month	Linear Worsening with Age
Fruits and Veggies <5 a Day	Linear Improving with Age

The Vermont BRFS for the years 1990 through 1998 gives a picture of the trends in diabetes risk factors. Not all questions are asked every year, and for certain combinations of risk factors, data were collected only during particular years. The general trends are:

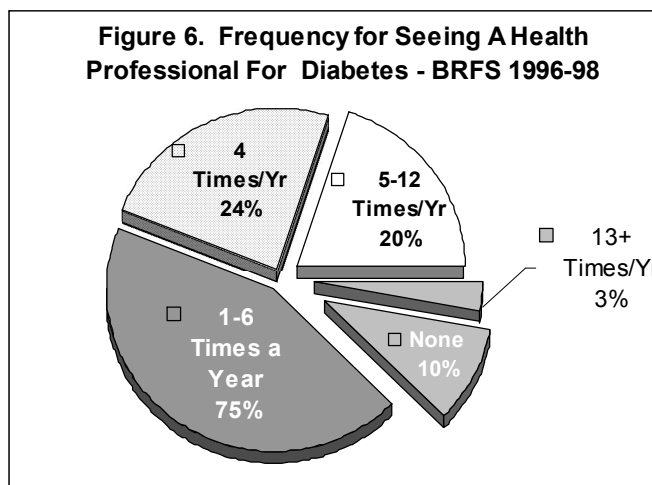
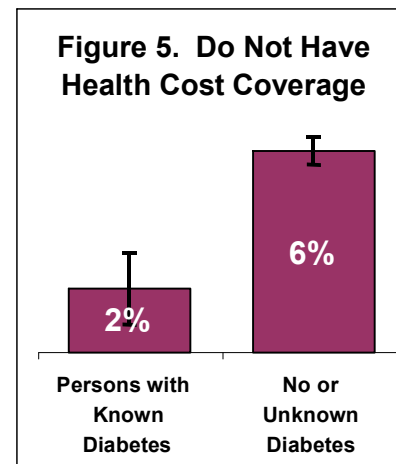
- Obesity is increasing markedly, with a hint that it is reaching a peak.
- The number of people who have been told that they have high blood pressure reached a peak several years ago and appears to be decreasing.
- The percentage of people who are physically inactive, while improving up to 1996, appears to have worsened in 1998.
- More and more people are eating the recommended amount of fruits and vegetables daily, albeit at a slowly increasing percentage.



The R²-square values on Figure 3 indicate how closely the annual rates fall to the line drawn through the scatterplot. With an R² equal to one, the points of the scatterplot fall directly on the line, while an R² of zero indicates that the points are randomly distributed with no pattern corresponding to the proposed line.

Risk Factors for Secondary and Tertiary Prevention

Among those who are aware that they have diabetes, their chances of controlling diabetes and avoiding complications may be affected by their access to medical care. While some may be able to afford medical costs without benefit of health insurance, only two percent of respondents with diabetes indicate that they lack third party medical cost coverage. This reflects the impact of diabetes on older citizens who are eligible for Medicare. Those respondents without

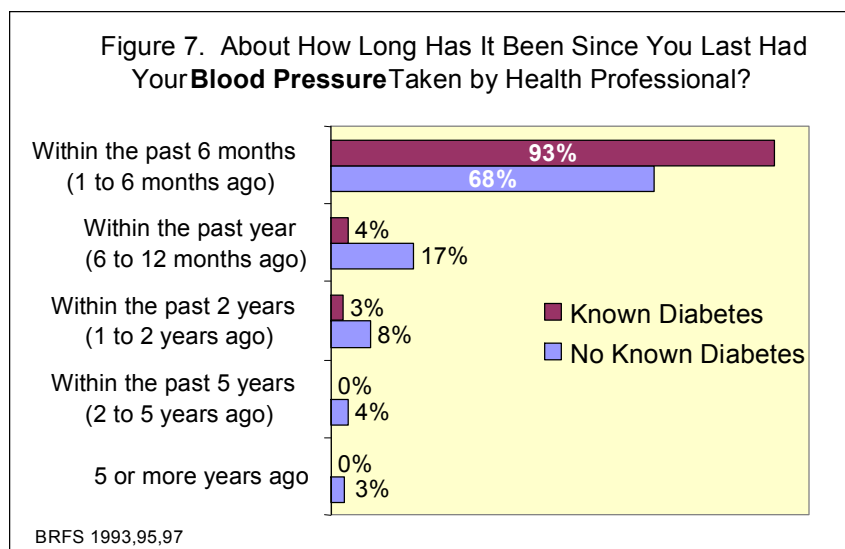


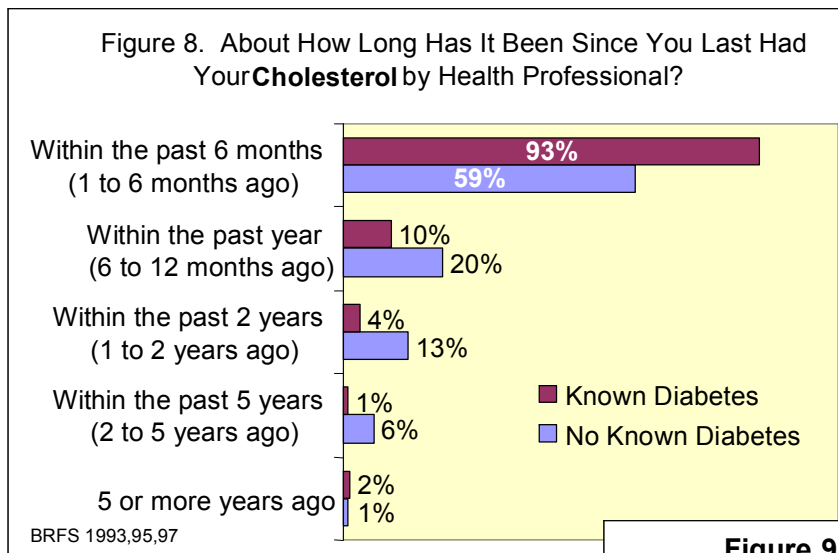
diabetes or who are unaware of their diabetes, about six percent lack third party medical cost coverage.

About three-quarters of Vermonters with diabetes see a health professional one to six times a year for their diabetes. Unfortunately, about ten percent have not seen a health professional in the last year for their diabetes. With only three years of data regarding this question, there is not enough data to adequately deter-

mine why these people are not seeing a health professional.

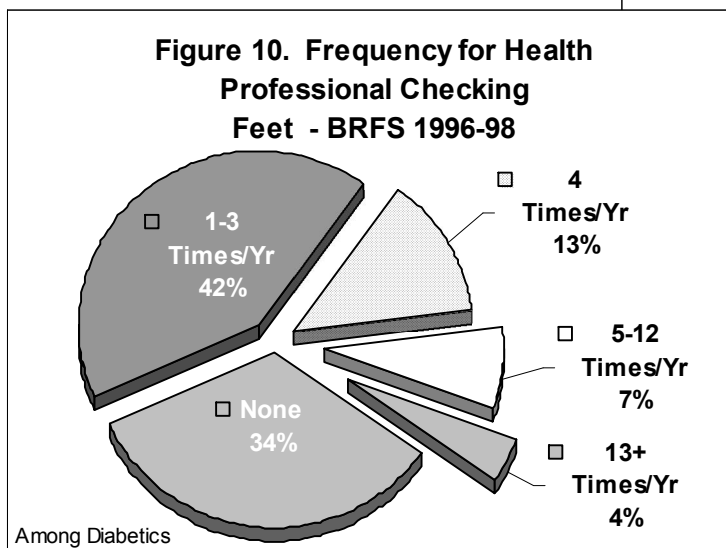
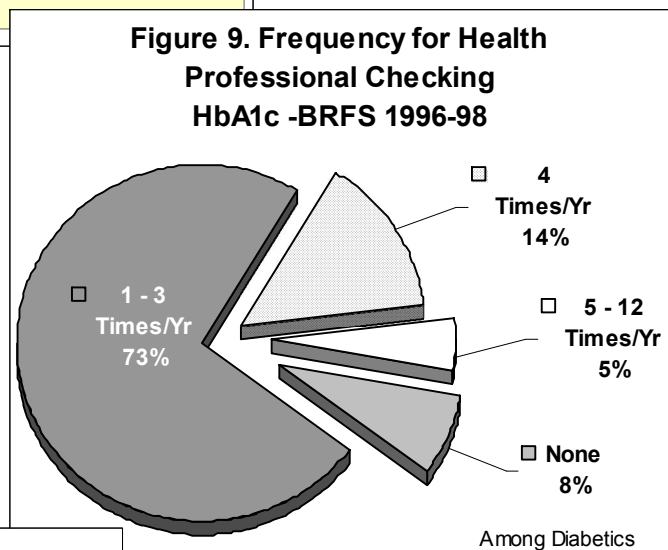
Those who know that they have diabetes more frequently have their blood pressure taken by a health professional when compared to those who either do not have diabetes or are unaware of their diabetes.





Those who know that they have diabetes more frequently have their cholesterol taken by a health professional when compared to those who either do not have diabetes or are unaware of their diabetes.

It was reported in a prior chapter pertaining to provider's preventive practices that (based on 1996-97 BRFS data) 73 percent of Vermonters with diabetes had their eyes and 63 percent had their feet examined by professionals in the last year. Based on 1996-98 Vermont BRFS data, about 73 percent of diabetics had their HbA1c



checked by a health professional one to three times in the last year. However, about eight percent did not have their HbA1c checked at all in the last year. From the same data, about 58 percent of diabetics had their feet checked by a professional one to six times in the last year, while 34 percent did not at all have their feet checked by a professional.

End Notes

¹ Vinicor, Frank. The Public Health Burden of Diabetes and the Reality of Limits. *Diabetes Care* 21 (Suppl. 3):C15–C18, 1998

² ADA web site: <http://www.diabetes.org/ada/risktest.asp>

³ Centers for Disease Control and Prevention diabetes web site: <http://www.cdc.gov/diabetes/faqs.htm>

⁴ National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, *Diabetes in America*, 2nd Edition, NIH Publication No. 95-1468, 1995