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## A Community-Based Participatory Approach to Personalized, Computer-Generated Nutrition Feedback Reports: The Healthy Environments Partnership

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Submitted 2 May 2007, revised 1 September 2007, accepted 22 October 2007.

### Abstract

**Background:** Computer tailoring and personalizing recommendations for dietary health-promoting behaviors are in accordance with community-based participatory research (CBPR) principles, which emphasizes research that benefits the participants and community involved.

**Objective:** To describe the CBPR process utilized to computer-generate and disseminate personalized nutrition feedback reports (NFRs) for Detroit Healthy Environments Partnership (HEP) study participants.

**Methods:** The CBPR process included discussion and feedback from HEP partners on several draft personalized reports. The nutrition feedback process included defining the feedback objectives; prioritizing the nutrients; customizing the

report design; reviewing and revising the NFR template and readability; producing and disseminating the report; and participant follow-up.

**Lessons Learned:** Application of CBPR principles in designing the NFR resulted in a reader-friendly product with useful recommendations to promote heart health.

**Conclusions:** A CBPR process can enhance computer tailoring of personalized NFRs to address racial and socioeconomic disparities in cardiovascular disease (CVD).

### Keywords

Community-based participatory research, computer tailoring, nutrition feedback, cardiovascular disease, dietary behaviors

**P**ersonalized nutrition feedback has been described as a nutrition information or dietary change strategy based on a specific individual's food habits.<sup>1-3</sup> Computer-tailored personalized NFRs, produced using dietary data collected through individual surveys, are a relatively new approach to dietary change.<sup>1,2</sup> Although substantial evidence links high dietary fat and low fruit and vegetable intakes to increased risk of several chronic diseases, including CVD, and despite nutrition and health promotion campaigns, most U.S. adults do not meet recommendations for these dietary factors.<sup>4</sup> Personal nutrition messages that are culturally, linguistically, and individually tailored are a promising strategy for dissemination of evidence-based nutrition guidelines to high-risk sociodemographic groups.

Despite the incorporation of computer-tailored personalized nutrition counseling in primary care practice<sup>5</sup> and work-site settings,<sup>4,6,7</sup> community-based applications are limited.<sup>8,9</sup> Intensive personal nutrition counseling such as those described in the literature may not be feasible in community settings. Innovative strategies are needed for reaching individuals with nutrition messages who might not otherwise participate in health-promotion activities. Furthermore, the majority of computer nutrition analysis programs produce complex quantitative reports that may be difficult for the general public to interpret.<sup>3,5</sup> The use of a CBPR approach can contribute to the development of computer-generated personalized reports that are accessible and easy to interpret, with clear recommendations for dietary change that are beneficial to the participants involved.

The primary objective of this article is to describe the use of a CBPR approach<sup>10–14</sup> to develop tailored computer-generated NFRs that were disseminated to non-Hispanic black, Hispanic/Latino, and non-Hispanic white community residents who participated in the Detroit HEP survey ( $n = 919$  participants).<sup>14</sup> CBPR is a “systematic inquiry, with the participation of those affected by the issue being studied, for the purposes of education and taking action or affecting social change.”<sup>12,13</sup> In keeping with the partnership’s CBPR principles described later in this article, the nutrition feedback process presented herein represents one of the primary focus areas for HEP, namely, community involvement in community-wide dissemination of the results and findings in ways that benefit the individuals and communities involved. Results from HEP data analysis have been disseminated widely through community forums, newsletters, and translation to local decision makers, as well as through peer-reviewed publications. In contrast with much of the literature on tailored messages, the nutrition feedback component of HEP described in this article was not designed as an intervention study, but as a strategy to disseminate personalized nutrition results to survey participants. The objective of the CBPR process described herein was to engage community representatives in all phases of the development and dissemination of a personalized NFR as one component of a larger CBPR effort.

## METHODS

### Formation of HEP Steering Committee and Adoption of CBPR Principles

HEP was initiated in October 2000 as a part of the National Institute of Environmental Health Sciences “Health Disparities Initiative,” and is affiliated with the Detroit Community–Academic Urban Research Center (URC).<sup>14,15</sup> The URC is made up of representatives from community-based organizations (CBOs), health providers, and academic institutions and has been working in Detroit since 1995 to identify and address priority health issues in Detroit (see Acknowledgments). The HEP study design was initially developed through discussion among members of the URC board before submission of the grant proposal and once funding was received, board members identified several new organizations from areas of the city involved in the study to join the HEP. The new CBOs invited to serve as members of the HEP Steering Committee (SC) were located

within the defined geographic communities for the study, had an interest in the study aims and had strong relationships with, and track records among, residents of those communities. The HEP SC, composed of representatives from each of the partner organizations, guides all aspects of the partnership.

The overall goals of HEP are to conduct research using a CBPR approach to further our understanding of relationships among socioeconomic position, race, ethnicity, exposures in the social and physical environments, and behavioral and biomedical risk markers for CVD among residents of Detroit, and to develop and evaluate interventions based on those findings to reduce and eventually eliminate racial, ethnic, and socioeconomic disparities in CVD in Detroit.<sup>14,15</sup>

Communities were defined as geographic areas within the city of Detroit (eastside [ES], southwest [SW], and northwest [NW]) and were selected based on criteria, including shared sense of identity, risk factors for CVD, strong CBOs, prior positive working relationships, and common interest in promoting heart health. The URC had previously worked in ES and SW Detroit, and recommended adding the third geographic community included in the HEP (NW Detroit) after discussing the research questions, to increase variation across study communities.<sup>14</sup> ES and NW Detroit are predominantly African American and SW Detroit is predominantly Latino.

The HEP SC adopted a set of CBPR principles that include recognizing the community as a unit of identity; building on strengths and resources within the community; facilitating collaborative partnerships in all phases of the research; integrating knowledge and action for mutual benefit of all partners; promoting a co-learning and empowering process that attends to social inequalities; involving a cyclical and iterative process; addressing health from both positive and ecological perspectives; and disseminating findings and knowledge gained to all partners including community members in ways that are understandable and useful.<sup>10–13</sup> Consistent with these CBPR principles, the HEP SC, made up of researchers based in academic institutions, health service providers, and representatives from CBOs, was engaged in all aspects of HEP study design and implementation.<sup>10,16,17</sup> Approval was granted for the HEP study in January 2001 by the University of Michigan Institutional Review Board for Protection of Human Subjects.

### Developing Personalized NFR: Role of the Partners

The SC was actively involved in designing the NFR, through the HEP Nutrition Working Group (NWG), a subgroup comprised of CBO and health service provider and academic members of the HEP SC (members of the NWG are indicated with an asterisk in the list of partners included in the Acknowledgments). The NWG met over a period of several months to discuss and provide input into the process of developing these feedback reports. Over the course of this time, the NWG brought recommendations to the full SC for discussion and to finalize decisions. In the following, we describe the CBPR process and the CBPR engagement for each phase of the development of the NFR (Table 1).

*Defining the Feedback Objectives.* Consistent with the CBPR principle that emphasizes “conducting research

that is beneficial to the communities involved,”<sup>10,11,14</sup> the published literature on the development of NFRs<sup>4</sup> suggests consideration of (1) personal relevance, individualization, and tailoring, (2) positive reinforcement, (3) facilitation of nutrition behavioral skills, and (4) dietary goal setting with respect to current nutrient intakes in comparison to Dietary Reference Intakes (DRI).<sup>18</sup> Members of the NWG discussed the types of individualization and tailoring of messages that might be offered within the context of the NFR, for example, U.S. Department of Agriculture (USDA) recommendations for vitamin C intake are higher for current smokers than for nonsmokers. Thus, respondents who reported that they currently smoked received recommendations for higher vitamin C intakes, as well as information about the relationship between smoking and heart disease, and tips on how to stop or reduce smoking. In addition, the NWG identified opportunities to

**Table 1. Healthy Environments Partnership (HEP) Steering Committee Engagement in the Process of Developing Personalized Nutrition Feedback Reports (NFR)\***

Steps in the NFR Process	Steering Committee Engagement in the Process
Defining the feedback objectives based on implications for dietary recommendations	Ensured that the reports are culturally appropriate, useful and accessible to the community who received them.  Applied a multitailored approach including age, body mass index, smoking status, gender, and measured systolic and diastolic blood pressures
Prioritizing nutrients highlighted in the report	Identified and prioritized nutrient intakes that have been demonstrated as particularly relevant to heart health (see American Heart Association, <sup>19</sup> Dietary Guidelines for Americans, <sup>20</sup> and the DRIs <sup>18</sup> )
Customizing the report design	Modified the dietary analysis printouts to increase their readability, accessibility, and usefulness as a tool for feeding back personalized nutrition information in a community setting
Reviewing and revising the NFR template	Made the report more visually appealing.  Incorporated specific <i>Healthy Eating Tips</i> and a phone number for follow-up.
Assessing readability	Improved readability by making changes to wording, complexity, meaning, and comprehension.
Producing and disseminating the personalized reports	Mailed each participant a personalized cover letter with his/her NFR (Appendix B)  Included resource pamphlets and customized the mailing for self-reported health characteristics
Responding to community participant follow-up on the report	Incorporated information for follow-up contact with the DDHWP nutritionist who provided information about portion sizes; hidden sources of sugar, fat, and sodium; suggested recipe modifications to reduce sugar, fat, and sodium levels; and label reading for cardioprotective micronutrients

CBPR principles were incorporated across all phases of the NFR production and dissemination processes.

\* The DDHWP organizes several ongoing health promotion and disease prevention activities for CVD, and referred HEP feedback recipients to CVD screening, cooking demonstrations to promote healthy eating, supermarket tours, and support groups.

CBPR = community-based participatory research; CVD = cardiovascular disease; DDHWP = Detroit Department of Health and Wellness Promotion; DRI = Dietary Reference Intakes.

provide positive reinforcement within the context of the NFR (e.g., when respondent's intake of particular nutrients was equal to or greater than the DRI recommendations).

The NWG was actively involved in tailoring the NFR to be culturally relevant. The previously validated 100-item Block FFQ<sup>19–26</sup> was modified by adding foods to better assess regional and culturally relevant food choices for the HEP study areas. Using the recommended additional food sources for key micronutrients highlighted in the report, participants were provided with very specific suggestions regarding dietary choices that included those commonly consumed foods, thus incorporating cultural preferences (e.g., mangoes, bean dip, and collard greens).

*Prioritizing Nutrients Highlighted in the NFR.* The focus of the HEP study was on cardiovascular health and the NWG prioritized nutrients relevant to heart health for inclusion in the NFR.<sup>27,28</sup> In keeping with HEP's commitment to research that benefits the participants and the community, we focused on reducing risk factors and enhancing health-protective factors. Hence, the NWG sought to provide personalized feedback and a balance of recommendations that included both dietary risk nutrients when consumed in excess (e.g., saturated fat intake) and protective factors (e.g., fruit and vegetable consumption), which resulted in a feedback report with considerable information considered by the NWG to be appropriate and readable. Trying to modify several dimensions of one's food choices at the same time can be challenging. The NWG prioritized six protective micronutrients based on dietary guidelines and their established importance for heart health.<sup>27,28</sup> These included the dietary antioxidant micronutrient vitamins A, E, and C; the B-vitamin folate; the major mineral calcium; and the electrolyte potassium. The Block analysis software used to calculate these nutrients from the modified Block FFQ also provided information on the trace minerals zinc and iron, which were also included.<sup>29</sup> In addition, total calories and fat, saturated fat, cholesterol, and sodium were included as nutrients that presented health risks when consumed in excess.<sup>27,28</sup>

*Customizing the NFR Design.* In developing the design for the NFR, the HEP SC began by reviewing the default Block nutritional analysis report shown in Appendix A. Altogether, six NFR prototypes in English and Spanish were produced and reviewed by HEP SC. At each stage in developing the report

prototypes, suggested revisions by community partners were incorporated to enhance the usefulness of the feedback reports for HEP survey participants.

*Reviewing and Revising the NFR Template.* A “first integrated draft” of the HEP NFR template was generated through an iterative process that involved review and revisions on several draft versions by the SC. For example, color-coded “emoticon” faces J L shown in Appendix B were adapted from the USDA Interactive Healthy Eating Index (IHEI)<sup>30</sup> to demonstrate visually whether each participant's nutrient intake met or fell short of the DRIs.<sup>18</sup> Positive reinforcement, listed at the bottom of the report, was adapted from the IHEI and denoted as appropriate to encourage continued intakes of heart-healthy protective micronutrients. The SC also recommended addition of specific *Healthy Eating Tips* and a phone number for follow-up with the nutritionist at the Detroit Department of Health and Wellness Promotion (DDHWP), a member of the HEP SC (see sample Nutrition Report in Appendix B).

*Assessing and Revising the NFR Readability Characteristics.* The SC made several recommendations to assure that the reading level was appropriate, aiming for 6th- to 8th-grade readability. For example, suggestions were made for revisions in wording (e.g., “recommendations” for healthy eating was changed to “tips” for healthy eating), complexity (e.g., “dairy” was simplified to “milk and cheese”), meaning (e.g., “nutrient risk factors” was changed to “nutrient risk factors when consumed in excess”), readability (e.g., distinct columns; revised length to a single page), and comprehension (e.g., linked practical healthy eating tips with results obtained from the HEP-FFQ).

The reading grade level estimates of text selected from the NFR were established using the Flesch–Kincaid formula available in the Microsoft Word 2000 software program. More than half of the content in the final NFR met the 6th- to 8th-grade level desired. Consistent with the documented literature regarding the limitations of incorporating nutrients in nutrition communication, there was a wide variability in the readability scores across the NFR, ranging between 4.0 (e.g., healthy eating tips) and 12th-grade level (e.g., names of nutrients). The principles for developing low-literacy materials were used in conjunction with NWG discussions. Based on the NWG discussions, we applied this software program for reading level estimates. The reading grade level

estimates of text selected from the NFR were established using the Flesch–Kincaid formula available in the Microsoft Word 2000 software program.

The quantitative matrices and qualitative features were transferred to designated fields and integrated into a final cohesive nutrition feedback template displayed in Appendix B. English and Spanish language reports were generated and Spanish translation was back translated to ensure accuracy of language.

*Producing and Disseminating the Personalized NFRs.* Reports were generated using the finalized format, and mailed to each HEP survey participant. Of the 919 participants, 57% were non-Hispanic Black/African American, 20% Latino, and 22% non-Hispanic white.<sup>14</sup> Of HEP survey participants, 53% reported household income above \$20,000/year.<sup>31</sup> There were 267 participants in ES, 268 in NW, and 384 in SW.

A personalized letter explained that the information on the report was based on the nutrition surveys they completed, and provided a step-by-step explanation for how to interpret their report. Based on the health risk characteristics shown in Table 2, individualized letters were generated and sent to participants at their homes. Participants who completed the survey in Spanish received a Spanish language version of the cover letter and the NFR; all other respondents received these materials in English. English and Spanish language resource

pamphlets that incorporated information from NHLBI<sup>32</sup> were mailed to study participants with their NFR, using the decision tree presented in Table 2.

*Responding to Participant Follow-Up on the NFR.* Fewer than 5% of HEP study participants who received the feedback reports in the mail brought the reports to the nutritionist at the Detroit Department of Health and Wellness Promotion (DHWP) or to representatives of other SC member organizations and requested additional information. Several participants who had ongoing connections with another HEP partner organization, Southwest Solutions, brought their NFRs to appointments with staff for discussion. The participation of staff members of these organizations in the HEP–NWG ensured that they were familiar and comfortable with the material included in the report, and prepared to engage in discussions with participants about their results and recommendations.

The nutritionist from the DHWP and community health partners from Southwest Solutions reported the following informal feedback from participants on the NFRs. Feedback included describing the reports as attractive, and indicating that they provided new information. Participants noted that the other food sources section was helpful and healthy eating tips, very helpful. Several participants particularly liked the emoticon faces and found them helpful, although others felt that this feature did not add anything extra to the report. The

Health Risk Factors	Pamphlets*
No risk factors	Heart Healthy <sup>†</sup>
Smoking only	Heart Healthy <sup>†</sup> ; Smoking <sup>§</sup>
Elevated BP only	Heart Healthy <sup>†</sup> ; Blood Pressure (BP) <sup>Q%</sup>
Overweight only	Heart Healthy <sup>†</sup>
Smoking and elevated BP	Heart Healthy <sup>†</sup> , Smoking, <sup>§</sup> BP <sup>Q%</sup>
Smoking, elevated BP, and overweight	Heart Healthy <sup>†</sup> , BP, <sup>Q%</sup> Smoking <sup>§</sup>
Elevated BP and overweight	BP, <sup>Q%</sup> Heart Healthy <sup>†</sup>

\* Pamphlets were developed with information from the National Institutes of Health and National Heart, Lung and Blood Institute.<sup>23</sup> Pamphlets were developed in both English language and Spanish language versions.

† “How to be Heart Healthy” sent to all respondents.

§ “How to Kick the Smoking Habit” sent to participants who reported in the survey that they were current smokers.

Q% “Your Blood Pressure and Blood Cholesterol: How to Keep them at a Healthy Level” sent to respondents with elevated blood pressure levels.

BP = blood pressure.

small font used for the reports was a concern for some, and others indicated that they did not find the age and gender results useful.

## LIMITATIONS

### Lack of Evaluation of the NFR

The nutrition feedback component of HEP was not designed as an intervention study, and therefore the NFRs were not formally evaluated. Formative evaluation designs that incorporate cognitive and behavioral outcomes, as well as affective results<sup>33</sup> are needed to confirm the contributions of the adaptations made to the HEP feedback reports described. Formal evaluations of participant use (e.g., read, saved) and perceived usefulness of the reports (e.g., interesting, personally relevant, understandable, credible) are needed. Such evaluations need to assess also the processes involved in using a CBPR approach<sup>34</sup> (cultural appropriateness, quality, usefulness, and readability). Questions about the perceived effects of the feedback on changes in nutrition attitudes, intentions, and choices should also be included.<sup>35</sup>

### Time Lag for Receiving the NFR

Another drawback was the time lag between completing the FFQ and participants' receipt of the NFR (average time was 27 weeks, based on the lag calculation for a random subset of 100 participants). Other studies using less complete measures of nutrition were able to provide feedback within 48 hours<sup>33</sup> to 2 to 4 weeks.<sup>36</sup> The longer the period between completion of survey and receipt of feedback, the greater the risk that the personal relevance of the feedback may be diminished.<sup>37</sup>

### Costs Involved in Creating the NFR

Another limitation of personalized nutrition feedback implemented in HEP is that it is more expensive than generic reports because of the detailed participatory processing required.

### Prioritizing the Nutrients for the NFR

Furthermore, efforts to keep the report short limited the number of nutrients ( $n = 13$ ) included in the HEP NFR. Our decision was also guided by reports published by Dennison and colleagues<sup>6</sup> that consumers can deal better with 10 dietary components than 50. People are likely to read and retain shorter

and more focused feedback, and hence there is a good rationale for prioritizing the feedback provided.

### Attention to Education and Literacy Levels

One limitation of the study that merits further attention relates to education and literacy levels. The HEP surveys were interviewer administered; hence participants did not have to be able to read to complete the survey. However, literacy levels need to be considered in the context of interpretation of the quantitative and qualitative information that was incorporated within the NFRs.<sup>38</sup> Attention was paid to reading level in designing the HEP NFRs to ensure that they would be accessible to participants of diverse reading levels. However, formal evaluation of the accessibility of the information included in the NFRs (e.g., reading level, interpretability) will be an important next step in understanding the usefulness of similar reports.

## LESSONS LEARNED

Despite these limitations, this examination contributes to our understanding of the contributions of applying CBPR principles to a nutrition feedback process.

### Combining CBPR Approaches With Technology

Lessons learned and recommendations from the CBPR process described focus on implications for the advancement of public health practice through the combination of CBPR approaches and the use of technology in promoting community health. The multidisciplinary composition of the SC enabled its members to provide diverse perspectives as well as knowledge of the communities they represented. Application of CBPR principles in designing the NFR contributed to the development of a product that was easy to read, and gave clear messages about actions survey participants could take to promote heart health. Practical applications of the CBPR principles in the HEP study facilitated interactions among community and academic partners that enabled the pooling of expertise and local resources that strengthened their base of knowledge and enhanced the development of personalized NFRs aimed at promoting healthy dietary practices. The incorporation of CBPR principles into tailored, nutrition-focused programs may serve as a valuable addition to ongoing and newly developed research programs. The work described

herein fills a gap in the existing literature by describing innovative concepts of using CBPR principles in developing and disseminating personalized NFRs. Such a participatory approach is viable for the development of other community-wide health promotion tools.

### **Tailoring the NFR Mailing Packets**

Upon the recommendation of the SC, not only were the NFRs themselves, but the content of the mailing packets, tailored for each participant. Brug and colleagues<sup>3</sup> have indicated that a strong point of computer-tailoring printed feedback is its ability to be mailed to an individual from a reliable source. Printed computer-tailored feedback reports were mailed to all participants with a cover letter signed by members of the HEP SC, including a representative from an organization in the area of the city in which the survey respondent lived, and from the DDHWP, also a member of the HEP SC. This was intended to enhance the credibility of the results, to enable participants to read it as many times as they wish and to share it with others, and to contact the SC representative from their area of the city if desired for further information.

### **Modifying NFR Based on Partner Recommendation**

The HEP SC suggested several modifications to enhance the ease of interpretation of the NFRs. Many of these recommendations are substantiated by the literature regarding tailored messages. For example, the inclusion of “emoticon” faces to provide visual feedback is consistent with literature noting the importance of the emotional and cognitive consequences of feedback on nutrient intakes.<sup>34</sup> Kennedy and Deckelbaum<sup>39</sup> suggest that personalized feedback in comparison with general recommendations can be helpful in enhancing motivation, and other studies have used similar mechanisms.<sup>6,22</sup> The comments from HEP participants were by and large very positive regarding the NFR, with the potential exception of the mixed responses regarding the emoticons. A subject for future research could be to explicitly test the acceptability of different versions of the NFR with different levels and amounts of information presented.

### **Providing Nutrition Feedback for Specific Future Actions**

The HEP SC also recommended that participants be

provided with specific actions they could take to improve dietary choices. Multiple tips were incorporated into the NFR, including cooking, and other tips for reducing nutrients considered to be risk factors when consumed in excess, as well as increasing consumption of protective nutrients.

### **Incorporating Qualitative and Quantitative Nutrition Components**

The HEP NFR was consistent with several recommendations from the literature including: automating the feedback process to handling of missing data and spelling or calculation errors; personalizing of feedback for both macro- and micronutrients<sup>25</sup>; tailoring of vitamin C intake for smoking status, age, and gender<sup>18</sup>; and adoption of Block-FFQ to allow qualitative (e.g., top food sources) as well as quantitative (e.g., nutrients) feedback.<sup>3,26</sup> Researchers<sup>2,40–42</sup> have suggested that putting the participant’s name on the feedback has greater effect than merely personalized messages.

### **Cultural Tailoring of the NFR**

Finally, HEP designed culturally tailored NFRs, consistent with the Institute of Medicine (IOM)’s call for disease prevention efforts that consider cultural factors when addressing the needs of diverse populations.<sup>18</sup> Personalizing information provides opportunities for tailoring that encompass sociodemographic, behavioral, cultural, and anthropometric characteristics of study participants. Although the Block FFQ is a previously validated tool,<sup>19–21</sup> the use of a modified FFQ in this study suggests the need to strike the right balance between tailoring and using validated instruments that address cultural and regional variations. Of relevance to note here is that Block has subsequently created some versions of the questionnaire that are specifically validated for various racial and ethnic groups, such as The Study of Women’s Health Across the Nation Spanish food frequency questionnaire, and this appears to be reasonably valid in assessing the dietary intakes for Hispanic participants.<sup>43</sup> The HEP nutrition reports incorporated evidence-based guidelines issued by widely recognized health agencies such as the IOM. Given regional variations in demographic characteristics and chronic disease burdens, evidence-based guidelines are likely to be more effective if tailored to the local community.<sup>41–42,44</sup>

## CONCLUSION

The involvement of community members, through the use of a CBPR approach, helps to ensure the relevance and usefulness of this tailoring process. Through this CBPR-guided process, the HEP SC discussed in detail how to communicate nutrition information to members of the study community. One of the principles of CBPR is an emphasis on capacity building.<sup>10–12</sup> Working on the NFR provided community input, increased knowledge and understanding among all members of the partnership, and improved the partnership's capacity to develop a user-friendly tailored product. This process built familiarity with the feedback mechanism among all partners, increasing their capacity to engage in discussions with HEP participants about dietary changes to improve heart health. This CBPR-guided nutrition feedback process demonstrates one means of fostering translation of newly emerging science into efforts to reduce CVD.

## ACKNOWLEDGMENTS

The HEP ([www.hepdetroit.org](http://www.hepdetroit.org)) is a project of the Detroit Community–Academic Urban Research Center ([\[.umich.edu/urc\]\(http://umich.edu/urc\)\). We thank the members of the HEP Steering Committee \(SC\) for their contributions to the work presented here, including representatives from Boulevard Harambee, Brightmoor Community Center,\\* Detroit Department of Health and Wellness Promotion,\\* Detroit Hispanic Development Corporation, Friends of Parkside, Henry Ford Health System,\\* Rebuilding Communities Incorporated, Southwest Detroit Environmental Vision, Southwest Solutions,\\* University of Detroit Mercy,\\* University of Michigan Schools of Public Health,\\* Nursing and Social Work and Survey Research Center. We also thank the following organizations for sharing their existing NFR formats for a preliminary review by the HEP SC and the HEP Nutrition Working Group: Block Dietary Data Systems \(Block Nutrient Analysis\), Henry Ford Hospital \(Heart-Smart Brochure\), and the University of Michigan Preventive Cardiology \(Heart-Healthy Plate\). HEP is funded by the National Institute of Environmental Health Sciences, #RO1 ES10936-0. This article is based on a paper presented at the Annual Meeting of the American Public Health Association, San Francisco, 2003. \(\\* Members of the HEP Nutrition Working Group\)](http://www.sph</a></p></div><div data-bbox=)

The following recommendations about your diet are based on the information you provided about your usual diet in the 12 months before you completed the Diet Questionnaire, and on the current Dietary Guidelines for Americans, published by the US Department of Agriculture. These guidelines, often illustrated by the USDA Food Guide Pyramid, recommend a diet consisting of less than 30 percent of calories from fat, 10-20 percent of calories from protein, and the remaining calories from carbohydrates. While there has been some discussion about individual items on the food pyramid, most experts agree that a low-fat diet, rich in fruits, vegetables and whole grains, combined with regular exercise, are key factors in maintaining a healthy weight level, leading a healthy lifestyle and reducing risk for disease.

**For better health, lower your fat intake to 30% of calories or less.**

To achieve this goal, eat more vegetables, fruits and grains, and fewer fatty foods. Look at your top three sources of fat. Try eating these less often or switching to smaller portions or low-fat types.

**Congratulations! You are getting a good amount of folate in your diet.**

Both men and women need it, to reduce the risk of heart disease and prevent birth defects. Good sources of folate are green leafy vegetables, oranges and orange juice, broccoli, and dried beans and peas. Breakfast cereals are also good sources. If you are capable of becoming pregnant, authorities recommend that you get 400 micrograms of folate from fortified foods or from vitamin supplements, in addition to your diet, because they are better absorbed.

**Congratulations! You are getting a good amount of calcium.**

It is needed for strong bones, and for regulating blood pressure, transmitting nerve impulses, and in blood clotting. Keep eating those low-fat dairy products and low-fat milk, and perhaps try calcium-fortified juice. Calcium supplements are also valuable, to ensure that you are getting enough.

**Congratulations! You are eating your fruits and vegetables!**

They can lower the risk of cancer and heart disease. And of course, they are usually low in fat. Experts recommend eating at least five servings, of a combination of fruits and vegetables, every day. Salads count, and vegetable soups and stews, and vegetable or fruit juices. A big bowl of salad, or a big plate of stew with lots of vegetables, might count as two or even three servings.

### **My Pyramid Food Groups**

Learn how your diet compares to USDA My Pyramid recommendations for your calorie level, at the bottom of the next page. Half of all your grain servings (breads, pasta, rice) should be whole grains. Since 2006 USDA gives fruit and vegetable advice as “cups” of food. Beneficial oils are from natural (unhydrogenated) vegetable oils and some foods, like avocados, nuts, seeds, and fish. My Pyramid has a website: <http://www.mypyramid.gov/>

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g = grams; mg = milligrams; µg = micrograms; IU = international units

Appendix A. *continued*

Your Nutrition Report

ID No.: 020159000

YOUR Average Intake		YOUR Recommended Levels	Where Nutrients Were Coming From in YOUR Diet
Calories	2347.1 Kcal	Depends on our age, sex, body size, activity level	<b>Calories:</b> Pizza, Nuts, Other vegetables <b>Total Fat:</b> Nuts, Pizza, Other vegetables <b>Saturated Fat:</b> Pizza, Chocolate candy, Cheeseburger  <b>Cholesterol:</b> Shellfish, NonFried Chicken w/o skin, Other fish
Total Fat	90.0 g	For you, 78 g or less.	
Fat as % of calories	34.5%	30% of total calories or less	
Saturated fat	25.7 g	Less than one-third of total fat	
Mono-unsaturated Fat	36.5 g	About one-third of total fat	
Poly-unsaturated Fat	21.7 g	About one-third of total fat	
Protein	121.1 g	59-117 grams	
Carbohydrate	275.0 g	293-352 grams (from whole grains, vegetables, and fruits; not sugar)	
Cholesterol	323.4 mg	Less than 300 mg	
Dietary Fiber	24.6 g	20-35 grams	
Alcohol % of calories	0%	1 drink/day or less	
Sweets % of calories	9.7%	Use sparingly. Full of empty calories and fat	
<b>Antioxidants From Food</b>			
Vitamin A	959.8 RAE	RDA: 700 RAE	
Beta-carotene	4214.0 mcg	5000-6000 mcg from food	
Vitamin C	122.9 mg	Good diet can provide 200-400 mg	
Vitamin E	10.8 mg	RDA: 12 mg	<b>Vitamins from supplements</b> Vitamin A: 1515.0 RAE Vitamin C: 60.0 mg Vitamin E: 13.5 mg Folate: 400.0 mcg Calcium: 1240.0 mg Iron: 18.0 mg Zinc: 15.0 mg
<b>B-Vitamins From Food</b>			
B1, B2	2.2 mg	RDA: 1.1 mg	
Niacin	33.1 mg	RDA: 14 mg	
Folate	696.7 mcg	RDA: 400 mcg DFE	
Vitamin B6	2.9 mg	RDA: 1.3 mg	
<b>Minerals From Food</b>			
Calcium	1088.5 mg	RDA: 1000 mg	
Zinc	16.5 mg	RDA: 8 mg	
Iron	21.3 mg	RDA: 18 mg	
Potassium	3545.2 mg	3000 mg or more	
Sodium (salt)	4548.1 mg	2400 mg or more	
<b>YOUR Food Group Servings</b>		<b>USDA My Pyramid 2006 Recommendations</b>	
Bread, pasta, rice	7.9 1-oz. equiv.	7 oz.-equiv. per day	
Whole grains	1.9 1-oz. equiv.	3.5 oz.-equiv. per day	
Vegetables group	2.2 cups	3 cups per day	
Without potatoes	1.9 cups	2.1 cups per day	
Fruits, fruit juices	1.6 cups	2 cups per day	
Milk, cheese, yogurt	2 cups	3 cups per day	
Meat, eggs, or beans	9.5 1-oz. equiv.	6 oz.-equiv. per day	
Good oils, in foods	3.9 "teaspoons"	6 "teaspoons" per day	

Questionnaire completed on: 11/12/2006

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g = gram; mg = milligrams; µg = micrograms; IU = international units

**Appendix B. Personalized Nutrition Feedback for Jane Doe from the Healthy Environments Partnership (HEP)\***

Sex: Female		Height (in inches): 63				
Age (in years): 51		Weight (in pounds, lbs): 162				
Blood Pressure (Systolic/Diastolic): 126/62		Based on your height your recommended weight range is 107-135.**				
The Following are Protective Nutrients		Your Actual Nutrient Intake		Your Recommended Nutrient Intake ***	Your Top Two Food Sources	Other Good Food Sources of this Nutrient ***
Vitamin A (Retinol Equivalents)		602	☺	500	Carrots, and Greens such as Spinach, and Mustard	Fresh Fruits and Vegetables Fortified Milk and Cereals
Vitamin E (milligrams)		4	☹	12	Nuts like Almonds, Pecans and Walnuts, and Eggs	Seeds and Nuts Fortified Cereals
Vitamin C (milligrams)		67	☺	60	100% Orange Juice, Grapefruit Juice, and Orange, Grapefruit or Tangerine	Fresh Fruits and Vegetables
Folate (micrograms)		201	☹	320	Greens such as Spinach and Mustard and Cooked Cereal or Grits	Fresh Fruits and Vegetables Fortified Cereals
Calcium (milligrams)		326	☹	1200	Whole Milk	Low Fat Milk and Cheese
Potassium (milligrams)		1560	☹	2000	Ground Beef and 100% Orange Juice	Fresh Fruits and Vegetables
Zinc (milligrams)		7	☺	7	Ground Beef, and Nuts like Pecan and Walnuts	Shell Fish, Greens, Fortified Cereal
Iron (milligrams)		8	☺	5	Ground Beef and Pacakes, French Toast or Waffles	Red Meat, Peas, Fortified Cereal
The Following are Nutrient Risk Factors When Consumed in Excess		Your Actual Intake		Do Not Consume More Than	Your Top Two Food Sources	Tips for Healthy Eating
Calories (kcal)		1662	☺	1900	Regular Pop and Soda (Not Diet) and Ground Beef	Choose Whole Grain Bread
Total Fat (grams)		46	☺	Not to Exceed 65 grams	Ground Beef and Hot Dogs, Sausage and Bacon	Broil or Steam Foods Instead of Frying.
Saturated Fat (grams)		16	☺	Not to Exceed 20 grams	Ground Beef and Hot Dogs, Sausage and Bacon	Enjoy Leaner Cuts or Meats, Fish or Poultry (without the skin)
Cholesterol (milligrams)		329	☹	Not to Exceed 300 milligrams	Eggs and Ground Beef	Limit Eggs to about 2 to 4 per week. Eat Less Organ Meat.
Sodium (milligrams)		1538	☺	Not to Exceed 2400 milligrams	Hot Dogs, Sausage or Bacon and Fried Chicken	Experiment with Herbs and Spices instead of Salt. Limit Canned Food.

- ☺ Congratulations! Your intake meets estimated nutrient need.
- ☹ Your intake of this protective nutrient falls below estimated nutrient requirements.
- ☹ Exceeding the Recommended Intake of this Nutrient would be a Risk for Heart Disease.
- \* This feedback is provided for information purposes only and is based on your responses to the HEP Nutrition Survey.
- \*\* Recommendation is based on Guidelines of the National Heart Lung & Blood Institute.

\*\*\* Food Sources and Recommended Nutrient Intakes are adapted from the Dietary Reference Intake Reports, Institute of Medicine, National Academy of Sciences (2001).<sup>18</sup>  
 Please consult your health care provider or the Detroit Dept. of Wellness and Health Promotion (313-876-4550) for additional information. Personalized Nutrition Feedback is generated from Healthy Eating and Nutrition Education Project Software Program (Sri Kannan '02) and USDA Interactive Healthy Eating Index. Software Program was adapted for HEP by Sri Kannan's Nutrition and Biomarkers Laboratory UM EHS/SPH. HEP is funded by NIEHS Grant #R01 ES10936-01.

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