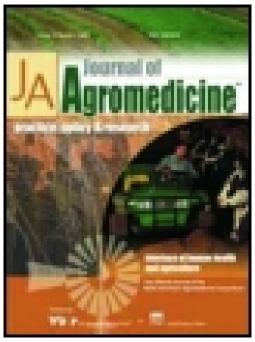

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Intervening to Improve Health Indicators Among Australian Farm Families

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ABSTRACT. The Sustainable Farm Families project (http://www.sustainablefarmfamilies.org.au/) was a 3-year demonstration and education project designed to influence farmer behavior with respect to family health and well-being among cropping and grazing farmers in Victoria, New South Wales, and South Australia, Australia. The project was conducted by the Western District Health Service, Hamilton, Australia, in partnership with farmers; Farm Management 500 (peer discussion group); the Victorian Farmers Federation; Royal Melbourne Institute of Technology; and Land Connect. During the 3 years of the project, 128 farmers—men (70) and women (58)—were enrolled. The project utilized a combination of small group workshops, individualized health action plans, and health education opportunities to encourage farm safety and health behavior changes and to elicit sustained improvements in the following health indicators: body mass index (BMI), total cholesterol, fasting blood glucose, and blood pressure. Mean changes in these health indicators were analyzed using repeated measures analysis of variance (ANOVA) and McNemar's test compared the proportion of individuals with elevated indicators. Among participants with elevated values at baseline, the following average reductions were observed: BMI 0.44 kg/m^2 ($p = .0034$), total cholesterol 48.7 mg/dl ($p < .0001$), blood glucose 10.1 mg/dl ($p = .0016$), systolic blood pressure 12.5 mm Hg ($p < .0001$), and diastolic blood pressure 5.0 mm Hg ($p = .0007$). The proportion of participants with elevated total cholesterol at baseline decreased after 24 months ($p < .001$). Such findings suggest that proactive intervention by farmer associations, rural health services, and government agencies may be an effective vehicle for promoting voluntary farm safety and health behavior change while empowering farm families to achieve measurable reductions in important health risk factors.

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INTRODUCTION

According to data from the Australian Bureau of Statistics (ABS) for 1999–2000, there were 155,000 businesses in Australia with an estimated value of agricultural operations of $5000 or more, with the majority engaged in beef cattle farming, mixed grain/sheep/beef farming, sheep farming, grain growing, or dairy cattle farming.[1] In 2007, the number of people employed in agricultural industries rose to a yearly average of 334,000 persons, the first increase in 5 years.[2] At the same time, the health of Australian farmers has become a more salient issue, as this workforce is aging and working longer and harder, and relying on family members for extra labor.[2] Health is a valuable resource for Australian farmers, as it translates into the capability to work and produce enough income to survive.

Few health-related programs directed toward farming families exist, although many other occupations have worksite health promotion or intervention programs. Not only is agriculture an occupation with one of the highest rates of work-related fatalities, but farmers may experience premature mortality and excess morbidity as a result of other factors related to the agricultural lifestyle. Previous studies have indicated that U.S. farmers have a 30% higher prevalence risk of cardiovascular disease and 40% greater risk of hypertension as compared to other workers,[3] whereas Australian male farmers have been shown to have a 39% greater all-cause mortality rate than other working males.[4] Other findings are equivocal, suggesting that farmers in North America, Europe, Australia, and New Zealand have lower overall mortality rates, lower heart disease rates, and lower cancer mortality rates than the general population.[5] Data in Australia are limited in relation to female farmers, as up until 1996 only one member of a marriage could record him/herself as the active farmer. Changes in census data collection have since addressed this important factor.

The development of the family farm as a method to populate and establish land during early colonization is a commonality to the history of both the United States and Australia that has left lasting impacts on agricultural practices today. Although family farms are decreasing in number, they remain the most common farming establishment with 99% of farms being family owned and operated in Australia[6] and 98% of U.S. farms.[7] The Australian and U.S. agricultural workforces are aging while working longer hours, with over 70% of Australian farmers aged 35 years or older in 2003, compared to 58% for the rest of the Australian economy, and work an average of 50 hours per week, compared to 42 hours for the total workforce.[8] Despite a successful subsidized national health insurance program, distance and access to health care remain a challenge for Australian farmers. Programs addressing these needs are important to farmers and their families and serve as the motivation for the development of the Sustainable Farm Families (SFF) program. The findings of this paper are based on extensive farming enterprises in southeastern Australia, where the climate is warm and dry and stock are never housed in winter. The SFF has since been trialed successfully in other agricultural populations such as dairy, cotton, and sugar, suggesting that there is much that binds farming populations together.[9]

Health fairs in the United States have been shown to have some effectiveness in improving health and safety among farming populations with relatively low costs, based on self-reported changes in lifestyle and work safety changes.[10] A key limitation of health fairs is the inability to objectively evaluate participants' behavior modifications. Interventions that enroll participants are more expensive, but provide a better opportunity to evaluate program effectiveness. Companies will often support worksite health programs by providing the resources with the benefit of lowering health care costs and having more

TABLE 1. Summary of Selected Worksite and Community Interventions Among Different Populations

Reference	Intervention	Indicators	Results
Worksite Interventions			
Haines, et al., 2007 [11]	12-week worksite intervention in college faculty and staff	BMI, blood pressure, blood glucose, cholesterol	Some statistically significant differences in baseline and follow-up BMI, cholesterol and blood glucose
Williams, et al., 2004 [17]	Worksite intervention with urban and rural low-income African-American women	Blood pressure, Body mass index (BMI), total cholesterol	Rural group able to significantly lower total cholesterol and reduce percentage with elevated cholesterol
Williams, et al., 2001 [19]	Worksite intervention with minority non-profit daycare workers	Blood pressure, total cholesterol, BMI	Statistically significant decrease in mean values of cholesterol and blood pressure
Maes, et al., 1998 [16]	Worksite intervention to improve health and wellness at a Dutch manufacturing plant	Total cholesterol, blood pressure, BMI, smoking	Achieved favorable short-term changes to health risks including reduced cholesterol level
Martínez-González, et al., 1998 [21]	Worksite intervention using face-to-face counseling to reduce mean coronary risk in Spanish workers over 3 years	BMI, blood pressure, cholesterol and smoking	Achieved small, statistically significant reduction in mean coronary risk
Community-Based Interventions			
Schuit, et al., 2006 [15]	Five-year community-based CVD prevention program targeting both the general population and those with identified risk factors for CVD.	BMI, waist circumference, blood pressure, serum glucose, serum total and high-density lipoprotein (HDL) cholesterol	Compared to the reference population, the intervention group significantly ($p < 0.05$) reduced BMI, waist circumference, and systolic blood pressure. Women, in addition, lowered total cholesterol and serum glucose
Lupton, Fønnebø, and Søgaard, 2003 [18]	Community-based intervention targeting CVD risk factors in Norwegian fishing community.	Blood pressure, cholesterol, BMI	Statistically significant reductions of blood pressure in the intervention group (as compared to reference group)
Weinehall, et al., 1999 [20]	Intervention to prevent cardiovascular disease (CVD) in a high-risk rural Swedish community with 8 years of follow-up.	Total cholesterol, blood pressure, BMI, smoking status	Reduced cholesterol and systolic blood pressure in male and female intervention groups with statistical significance.

efficient workers.[11,12] Persons working on family farms or other small agricultural operations cannot take advantage of worksite interventions. In agricultural health programs, chronic diseases such as cardiovascular disease or diabetes are often overshadowed by emphasis upon injury prevention, and scientific literature on such disease prevention programs among agricultural populations is lacking.[13,14] Some health promotion programs/intervention studies among smaller populations of workers have been summarized in Table 1. Worksite and community interventions generally produce small statistically significant reductions in health indicators, but may impact a large number of people.[11,15–21]

The purpose of the Sustainable Farm Families project was to go beyond the traditional, one-time health fair model to engage farmers in an ongoing, forward-looking series of health promotion activities. These included annual health workshops and health assessment, individual action plans, small group discussions, and periodic newsletters. These activities were aimed at achieving measurable reductions in body mass index (BMI), total fasting cholesterol, fasting blood glucose, and blood pressure.

METHODS

This analysis determined the effectiveness of the Sustainable Farm Families (SFF) project in altering four clinical health indicators among Australian farm family members: BMI, fasting blood glucose, total fasting cholesterol, and blood pressure. The Western District Health Service (WDHS) in Hamilton, Victoria, located in southeastern Australia, developed and initiated the SFF project in 2003 as a pilot project to address several health and safety issues among farmers within three adjoining states. Recruitment occurred through farming industry networks in the region, mainly Farm Management 500 (a private extension service linking farm families and business) along with the Victorian Farmers Federation. However, the program was open to any volunteering members of a family farming operation, provided they had been farming at least 5 years and between 18 and 75 years of age. Potential participants were contacted by industry personnel or WDHS and consenting individuals' information was given to the SFF team for official enrollment in the program. A total of six SFF workshops were conducted in five towns across the regions commencing in 2003 (Figure 1).

FIGURE 1. Towns in southeastern Australia in which Sustainable Farm Families workshops were held.

The Sustainable Farm Families Intervention

A workshop approach provided the opportunity for the SFF team to interact with participants in a variety of ways, taking advantage of the small group atmosphere. Applying Ajzen and Fishbein's Theory of Reasoned Action and Theory of Planned Behavior,[22] which posit that factors such as individual beliefs, social norms, and perceived power or control strongly influence behavioral intention and outcomes, the project designers hypothesized that active stakeholder engagement in health workshops and assessments would encourage motivation to comply and ultimately elicit measurable reductions in four clinical risk factors.[23] Kolb's Experiential Learning Model[24] also influenced the delivery and presentation of topics so as to facilitate learning comprehension. Behavioral changes were encouraged by engaging participants to share their values and beliefs in peer groups, presenting the consequences of poor health and safety behavior, and providing ways to modify behavior to produce positive health outcomes.[25]

Workshops were held in different towns to accommodate more farmers in the region and the two workshops in Hamilton allowed for greater enrollment (Figure 1). Each phase of the 3-year project included specific activities linked to specific intermediate objectives, with the long-term aim of reducing risk factors and improving health (Figure 2). Initial workshops in 2003 lasted 2 days and consisted of presentations of pertinent rural health and agricultural health and safety topics, a supermarket tour, and a health assessment. Prior to delivery of any information, focus group discussions

FIGURE 2. Projected sequence of intended outcomes from the SFF project. From Boymal J, Rogers P, Brumby S, Willder S. Living longer on the land—An economic evaluation of the Sustainable Farm Families Program. RIRDC Pub. No 07/094, Canberra, Australia, 2007.

Participation in SFF project	Behavior changes	Changes in clinical indicators	Changes in morbidity and mortality	Benefits of these changes
	Self-report	Measured after 1 year and after 2 years	Projected changes	Estimated benefits
	• Eating healthier food • More exercise • Safer farming work practices • Health follow up checks • Changes in alcohol consumption	• Obesity-related indicators: ○ Waist circumference ○ Body mass index ○ Waist-hip ratio ○ Percentage of fat in body mass • Blood glucose level • Blood pressure ○ Systolic ○ Diastolic • Cholesterol level • Pulse rate • General health score	Reduced risk of Cardiovascular event • Death due to cardiovascular event • Diabetes In addition, given the content of the sessions, there are likely to be reductions in • Farming accidents • Cancer • Anxiety and Depression	• Increased quality adjusted life years • Downstream cost savings

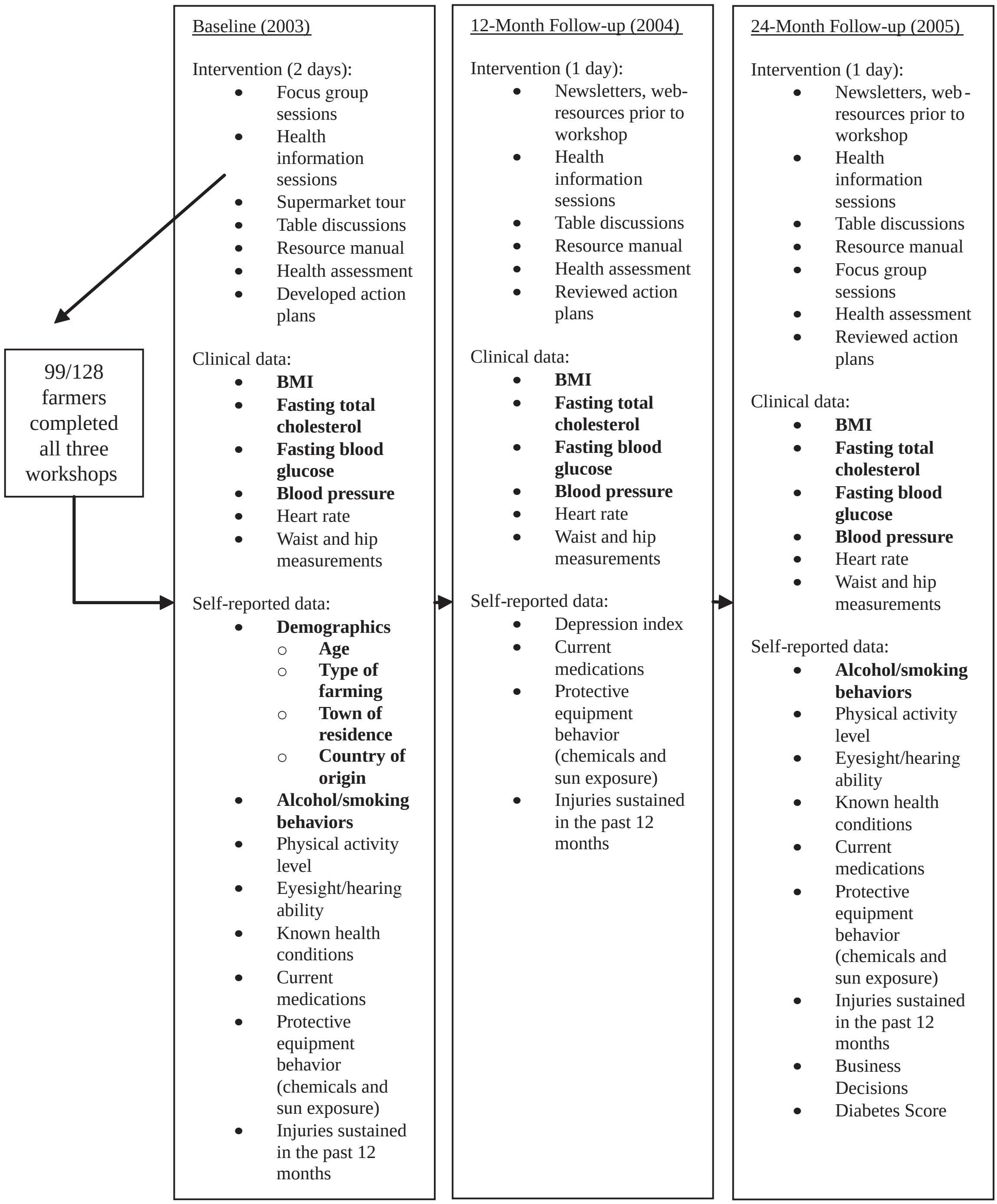
moderated by a social scientist covered participants' knowledge of health, well-being, and safety, with the goal of encouraging participation, including the exchange of ideas about general farm health and safety. Provided at the first workshop, a resource manual allowed participants to log their personal information, record measures of health, and list learning outcomes and goals.[23] The manual also served as a reference for health information, but was *not* a source of data collection for the project team. Follow-up workshops in 2004 and 2005 (12 and 24 months after the initial workshop) lasted 1 day, covered new topics and repeated the health assessment (Figure 3). Following the initial workshop, participants were encouraged to formulate action plans and to reflect on the new information learned as a way of developing goals and strategies to achieve these goals. Newsletters, Web-based resources, and the resource manual all served to reinforce the program concepts in the time outside the annual workshops.

The 30-minute health assessment conducted by a member of the project team with a background in nursing and farming as well as postgraduate qualifications measured common clinical health indicators useful in monitoring the risks of chronic diseases, such as cardiovascular disease (CVD) and diabetes. Referrals to general practitioners (GPs), dieticians, counselors, and naturopathic physicians regarding specific health conditions or findings were made when appropriate. In accord with established procedures for the protection of human research subjects, individuals with elevated clinical indicators were referred to their medical provider.

Data and Statistical Analysis

Participants' data were collected using self-reported questionnaires and records from the health assessment. Background and demographic information was collected using a questionnaire adopted from the Victorian Department of Human Services Service Coordination Tools.[26] Fasting measures such as total cholesterol and blood glucose were taken using a finger-stick test at the start of the annual workshop. Participants were instructed about the 10-hour fasting requirements 4 weeks prior to the date of the workshop. Systolic and

FIGURE 3. Summary of the SFF program. Items in bold are measures used or controlled for in the analysis presented in this paper.



diastolic blood pressures were measured with a standard sphygmomanometer. Height, weight, and waist and hip circumferences were measured. BMI was calculated using the formula: BMI = weight (kg)/height $(m)^2$. Participants were given their individual results to record in their resource manual. Physical assessment charts were securely stored in medical records at the WDHS office and stored in electronic form using SPSS version 14.0 for Windows.[27] Data for some variables were not collected at each year, such as demographic information, whereas other variables were collected at each workshop.

Analysis used both SPSS version 14[27] and SAS version 9.1.[28] Stratification into "elevated" and "nonelevated" groups for repeated measures analysis and binary variables used cut-off values chosen based on SFF triggers for referrals to health professionals. These values were decided upon by the SFF ethics committee, and were within Australia's National Health and Medical Research Council (NHMRC) and AusDiab guidelines.[29,30] Descriptive statistics and McNemar's test were calculated using SPSS. Repeated measures analysis of varaince (ANOVA) and regression models controlling for potential confounders (age, gender, and smoking status) were performed using SAS. For all calculations, statistical significance was defined by $p \leq .05$.

McNemar's test compared the proportion of individuals with elevated indicators at baseline and 24 months. Regression analyses evaluated the effect of the SFF program while controlling for confounding factors. Repeated measures ANOVA models were fit for the elevated and nonelevated groups for each indicator. The primary predictor variable for the adjusted differences was the SFF project (a categorical variable 'year' that equals '1' at baseline, '2' at 12 months, and '3' at 24 months), with age at baseline, gender, and smoking status (represented by 'never smoked,' 'currently smokes,' and 'recently quit smoking') included as potential confounders. Trend analysis was conducted separately by including the 'year' variable as a continuous predictor as opposed to a categorical variable.

RESULTS

Of the 128 participants initially enrolled, 116 attended the 12-month follow-up and 105 attended the 24-month follow-up. This analysis included only participants who attended all three workshops, 99 in total (participation rate of 77.3%), with an average age of 47.46 ± 8.53. Individuals were excluded from analysis if attendance was missing for any of the three workshops, 29 in total, and were not significantly different than those attending all three sessions at baseline with respect to each of the clinical health indicators, gender, or town, as compared using chi-square and independent *t* tests. All participants' characteristics, including those who did not attend the entire program, are shown for each year in Table 2. The 99 participants included more males (54, participation rate of 77.1%) than females (45, participation rate of 77.6%), ranged in age from 18 to 75 years, and most were involved in at least two types of farming, sheep and cattle (60.9%).

Participants with elevated values of clinical health indicators at baseline (elevated group) were considered separately from participants with nonelevated values (nonelevated group). Comparisons of the mean values of the four clinical health indicators in the elevated groups at baseline to the mean at both the 12- and the 24-month follow-up assessments using repeated measures ANOVA found statistically significant reductions in all indicators, where "elevated" had been defined as BMI ($\geq$25 kg/m^2), total cholesterol ($\geq$212 mg/dl), blood glucose (99 mg/dl), and blood pressure (systolic $\geq$140 mm Hg or diastolic $\geq$90 mm Hg). For the nonelevated subgroups, a statistically significant decrease in the group mean total serum cholesterol was found, whereas an increase in fasting blood glucose was found to be statistically significant at 24 months but not at 12 months. The magnitude of the changes, as well as the group mean at baseline, is shown in Table 3.

The repeated measure ANOVA model characterized the SFF treatment effect on the outcome measures of clinical indicators for BMI, total cholesterol, fasting blood glucose, and systolic and diastolic blood pressures, while controlling for confounding effects. The 'treatment' effect was statistically significant for each of the health measures tested: BMI, total cholesterol, fasting blood glucose, and systolic and diastolic blood pressures. The potential confounders age, gender, and smoking status were not statistically significant in any of the models based on $p \leq .05$, indicating these

TABLE 2. Characteristics for All Participants in the Sustainable Farm Families Program

Variable	Baseline		12 month		24 month	
	No.	Mean (SD) or %	No.	Mean (SD) or %	No.	Mean (SD) or %
Age	128	47.26 (8.79)	116	48.63 (8.92)	108	49.41
Male	70	54.7	65	56.0	59	45.4
Female	58	45.3	51	44.0	49	54.6
Workshop Enrollment						
Hamilton*	45	35.2	40	34.5	41	38.0
Horsham	24	18.8	21	18.1	16	14.8
Swan Hill	22	17.2	22	19.0	19	17.6
Clare	21	16.4	20	17.3	19	17.6
Benalla	16	12.5	13	11.2	13	12.0
Body Mass Index (kg/m^2)	127	26.16 (3.49)	116	26.03 (3.47)	104	25.95
≥25 kg/m^2 (%)	79	62.2	71	61.2	60	57.7
Total Fasting Cholesterol (mg/dl [mmol/L])	128	209.0 (40.6) [5.40 (1.05)]	116	194.7 (36.0) [5.03 (0.93)]	104	184.9 (29.7) [4.78 (0.77)]
≥ 212 mg/dl [≥5.49 mmol/L] (%)	53	41.4	36	31.0	18	17.3
Fasting Blood Glucose(mg/dl [mmol/L])	128	89.6 (10.9) [4.98 (0.60)]	116	88.7 (9.7) [4.93 (0.54)]	104	91.0 (9.5) [5.06 (0.53)]
≥99 mg/dl [≥5.49 mmol/L] (%)	17	13.3	15	12.9	17	16.4
Systolic Blood Pressure (mm Hg)	128	126.6 (14.8)	116	124.2 (12.8)	104	122.5
≥120 mm Hg (%)	37	28.9	22	19.0	13	12.5
Diastolic Blood Pressure (mm Hg)	128	79.4 (8.7)	116	80.1 (7.8)	104	79.1
≥90 mm Hg (%)	28	21.9	22	19.0	18	17.3

factors did not confound the treatment effect. Table 3 shows *p* values for the crude trend analysis unadjusted for confounding and those which have been adjusted.

The proportion of participants with elevated health indicators at baseline was compared to the proportion at the 24-month follow-up using McNemar's test. The proportion of participants with elevated total cholesterol was reduced and found to be statistically significant; however, the proportion did not change with statistical significance for the other three health indicators, BMI, fasting blood glucose, and blood pressure (Table 4).

DISCUSSION

The aim of the SFF project was to provide a demonstration and educational approach to improving health of the Australian farming families. This analysis showed that on average SFF participants found to have clinical indicators above the recommended values for BMI, fasting total cholesterol, fasting blood glucose, and blood pressure in the baseline year were able to achieve statistically significant reductions. These indicators are well documented for increasing incidence of chronic diseases such as diabetes and cardiovascular disease in particular.[28]

In the elevated sample, there was a greater reduction in indicator results, including cholesterol, blood glucose, body mass index, and systolic and diastolic blood pressures, over the 24-month period. The SFF team members believe the explanation for this was that once these individuals were identified to be "at risk," the subsequent health education and individual and small group discussion helped participants to better understand the link between the elevated risk factor and associated disease processes. The change over the 24 months reveals a sustained health response and is evidence of reduced risk for specific lifestyle factors within this sample. The individuals with elevated health indicators were given support and education together with a complete referral to their nominated health care provider following the program. This process was deemed appropriate and under ethics approval each health participant

TABLE 3. Changes Among Health Indicators of SFF Participants in Both Elevated and Nonelevated Groups

Health indicator	Baseline mean (SD)	12-Month mean (SD)	*p*	24-Month mean (SD)	*p*	*p* trend (crude)	*p* trend (adjusted)
Body Mass Index (kg/m^2)							
Elevated group (*n* = 67)	27.84 (2.51)	27.43 (2.51)	.0052	27.40 (2.89)	.0033	.0034	.0034
Nonelevated (n = 32)	22.33 (1.68)	22.44 (2.01)	.5069	22.41 (2.05)	.6352	.6331	.6331
Total Serum Cholesterol (mg/dl) [mmol/L]							
Elevated group (n = 45)	250.1 (26.2) [6.47 (0.68)]	214.7 (32.6) [5.55 (0.84)]	<.0001	201.4 (28.3) [5.21 (0.73)]	<.0001	<.0001	<.0001
Nonelevated (n = 54)	181.1 (24.3) [4.68 (0.63)]	179.9 (31.6) [4.65 (0.82)]	.7581	171.7 (23.3) [4.44 (0.60)]	.0188	.0188	.0188
Fasting Blood Glucose (mg/dl) [mmol/L]							
Elevated group (n = 13)	107.2 (7.4) [5.95 (0.41)]	96.0 (6.6) [5.33 (0.36)]	.0002	97.1 (11.4) [5.39 (0.63)]	.0006	.0016	.0016
Nonelevated (n = 86)	87.1 (9.3) [4.84 (0.52)]	87.5 (10.0) [4.86 (0.56)]	.6568	90.5 (8.9) [5.03 (0.49)]	.0006	.0006	.0006
Systolic Blood Pressure (mm Hg)							
Elevated group (n = 26)	145.0 (9.5)	134.6 (10.4)	<.0001	132.5 (13.5)	<.0001	<.0001	<.0001
Nonelevated (n = 73)	119.3 (10.1)	119.3 (10.7)	.9646	119.1 (12.4)	.8765	.8761	.8761
Diastolic Blood Pressure (mm Hg)							
Elevated group (n = 23)	90.9 (2.9)	85.2 (5.7)	<.0001	85.9 (6.0)	.0003	.0007	.0007
Nonelevated (n = 76)	75.7 (7.1)	78.5 (7.6)	.0020	77.4 (7.7)	.0668	.0717	.0717

Note: p values are for repeated-measure ANOVA, for crude trend and trend adjusted for age, gender, and smoking status.

TABLE 4. Changes in the Proportion of Participants With Elevated Health Indicators From Baseline to 24 Months

Indicator	Proportion elevated at baseline	Proportion elevatedafter 24 months	*p*
Body Mass Index	0.636	0.596	.388
Total Cholesterol	0.455	0.182	<.001
Fasting Blood Glucose	0.131	0.172	.541
Blood Pressure (Systolic and Diastolic)	0.323	0.232	.093

received a copy of his or her referral. Several participants as a result of the SFF project and assessment identified other health issues in early stages including melanoma, bowel cancer, anxiety, and depression.

The participants who were deemed "not at risk" based on health indicators within the normal range in the initial assessment maintained average levels of three indicators and showed favorable change in total cholesterol over 24 months that was statistically significant. Members of this sample revealed an indicator at baseline that was not elevated and thus these participants were not given the same referral and in-depth education during their one-on-one physical assessments, where all personal results were discussed. Nevertheless, these participants did show improvement for total cholesterol even though they were not at risk. Fasting blood glucose levels in this group did increase at 24 months, and although this increase was found not likely due to chance, the mean was still within the range considered nonelevated. These findings indicate that even though this cohort of individuals was not at risk, its members nevertheless reaped some health benefits from the program information and from their individual health assessments.

The results achieved support the initial goals of the SFF project in influencing farming family health through education, behavior changes, changes in clinical indicators, and ultimately changes in morbidity and mortality. The results also highlight a specific link to Ajzen and Fishbein's behavioral change theory[22] and Kolb's experiential learning model[24] and how families learn not only from educators but also through each other in an open and supportive environment. The project focus, although primarily on health indicators and the relationship to disease, was structured in such a way that participants associated health as an important factor in the farming business. Focus group discussion also highlighted that the positive changes in individual health represented affirmative links to the farming business and the importance of good health to a productive farm family business.

Overall, the results show a sustained improvement or maintenance of health indicators in both the elevated and nonelevated health indicator groups. Similar community and worksite interventions have shown consistent or more modest findings among analogous health indicators.[11,15–21] Clinically, reductions of the magnitude observed from the SFF project are relevant considering participants were able to reduce or maintain levels of multiple health indicators over a 3-year period. The SFF participant population has limited access to other wellness programs, such as worksite health interventions, therefore the overall reduction of cardiovascular and diabetes risk is beneficial as the SFF project was a nonpharmacological and relatively inexpensive intervention. This finding is also supported in the report by Boymal et al., who illustrated that the SFF project was cost effective in reducing predicted mortality associated with type 2 diabetes and cardiovascular disease among SFF participants.[31] The question still exists as to how long these improvements can be maintained. Given the fact that emphasis was made in the third year of the project on diabetes, physical activity, and health decisions, and their effect on the farming business and vice versa, many participants found that these topics reinforced and compounded material learned during the prior 24 months.

The evaluation described here was limited in the ability to evaluate whether certain components of the SFF project, such as the health assessment or the educational presentations, had unequal impact. The SFF ethics committee deemed withholding the intervention from some participants unethical, and therefore a comparison group is not possible. Influences from outside sources were not controlled for and may have impacted the health behaviors of participants, either favorably or unfavorably. It is uncertain whether the results are replicable among other populations, because the project consisted of self-selecting farming families; selection favoring participants more motivated to change could bias results away from null. Further evaluation of the SFF project is warranted to determine its generalizability among other populations.

CONCLUSION

These results support the idea that the combination of education, evidence-based information, shared learning, and reinforcement of positive health behaviors results in a sustained lifestyle and health indicator benefit. The health indicators measured at the initial and 12- and 24-month periods reinforce the learning and synergistic effect of health behaviors and reduced risk for all participants.

Statistically significant reductions in risk factors were achieved over the course of the SFF 3-year intervention; the size and clinical impact of these reductions varied among individuals, but is nevertheless promising. Longitudinal studies would assist in assessing the long-term benefit to the farm families involved in the project, as initial data available reveal significant positive outcomes derived from the project. This study warrants further investments into continuation of this project and similar programs, to investigate the long-term health and well-being benefits, to determine the clinical value of health indicator reductions, and to discern if changes are maintained. This approach to adult learning, education, assessment, and making health an important part of a family farm business sets the Sustainable Farm Families project aside as a program that promotes sustainable health benefits to farming individuals and families.

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