Economic Evaluation of the Sustainable Farm Families Project

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Stuart Willder

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Purposes of research project

• To undertake an economic evaluation of the SFF project, assessing its cost-effectiveness, cost-utility and cost savings.

• To develop a methodology for future economic evaluations

• Funded by the Joint Research Venture for Farm Health and Safety managed by RIRDC
Evidence of outcomes

<table>
<thead>
<tr>
<th>SFF project</th>
<th>Behaviour changes</th>
<th>Changes in clinical indicators</th>
<th>Changes in morbidity and mortality</th>
<th>Benefits of these changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-report</td>
<td>Measured after 1 year and after 2 years</td>
<td>Projected changes</td>
<td>Estimated benefits</td>
<td></td>
</tr>
</tbody>
</table>

- **Eating healthier food**
- **More exercise**
- **Safer farming work practices**
- **Health checks**
- **Obesity-related indicators:**
  - Waist circumference
  - Body mass index
  - Waist-hip ratio
  - Percentage of fat in body mass
  - Blood sugar level
  - Blood pressure
  - Systolic
  - Diastolic
  - Cholesterol levels
  - Pulse rate
  - General health score

- **Reduced risk of**
  - Cardio-vascular event
  - Death due to cardio-vascular event
  - Diabetes
  - In addition, there are likely to be reductions in:
    - (Farming accidents)
    - (Cancer)

- **Increased Quality Adjusted Life Years**
- **Downstream cost savings**

Evidence of causal contribution

- **Outcomes**
  - Participation in SFF project
  - Reported behaviour changes
  - Measured changes in clinical indicators
  - Projected changes in morbidity and mortality
  - Estimated benefits of these changes

- **Evidence of causal contribution**
  - Self-report
  - Absence of alternative causal explanations
  - Research evidence linking clinical indicators and specific morbidity and mortality outcomes
  - Research evidence of the cost of specific morbidity outcomes
SFF Program glimpses

Types of economic analysis

- Participation in SFF project
- Behaviour changes
- Changes in clinical indicators
- Changes in morbidity and mortality
- Benefits of these changes

Cost analysis
Cost-effectiveness
Cost-effectiveness
Cost-utility
Cost-savings
Mean changes in clinical parameters

<table>
<thead>
<tr>
<th>Change from baseline to</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong> (± <strong>Standard Error</strong>)</td>
<td><strong>Mean</strong> (± <strong>Standard Error</strong>)</td>
<td></td>
</tr>
<tr>
<td><strong>All participants (n=97)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General health score (where 1 = excellent and 5 = poor)</td>
<td>- 0.09 (0.78)</td>
<td></td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>- 0.25 (0.10) *</td>
<td>- 0.27 (0.13) *</td>
</tr>
<tr>
<td>Total cholesterol level (mmol/L)</td>
<td>- 0.43 (0.10) ***</td>
<td>- 0.70 (0.09) ***</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>- 1.16 (0.40) ***</td>
<td>- 1.59 (0.39) ***</td>
</tr>
<tr>
<td>Waist-hip ratio</td>
<td>- 0.01 (0.00) ***</td>
<td>- 0.01 (0.00) ***</td>
</tr>
<tr>
<td>Blood sugar level</td>
<td>- 0.06 (0.06)</td>
<td>0.09 (0.06)</td>
</tr>
<tr>
<td>Blood pressure (systolic) (mm Hg)</td>
<td>2.722 (1.07) *</td>
<td>-3.39 (1.23) **</td>
</tr>
<tr>
<td>Blood pressure (diastolic) (mm Hg)</td>
<td>0.92 (0.77)</td>
<td>0.82 (0.83)</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>- 0.58 (0.86)</td>
<td>- 0.41 (0.90)</td>
</tr>
</tbody>
</table>

* (p ≤ 0.05), ** (p ≤ 0.01), *** (p ≤ 0.001)

Change in clinical parameters for those at risk

<table>
<thead>
<tr>
<th>Participants at risk in base year 1</th>
<th>Sustainable Farm Families Project</th>
<th>Change from baseline to</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong> (± <strong>Standard Error</strong>)</td>
<td><strong>Mean</strong> (± <strong>Standard Error</strong>)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Participants at risk in base year 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body mass index ≥ 25 (n=67)</td>
<td>- 0.42 (0.13) **</td>
<td>- 0.44 (0.16) **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol level ≥ 4.5 mmol/L (n=80)</td>
<td>- 0.59 (0.1) ***</td>
<td>- 0.92 (0.09) ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Blood sugar level ≥ 5.5 mmol/L (n=13)</td>
<td>- 0.62 (0.13) ***</td>
<td>- 0.56 (0.15) **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist-hip ratio (n = 70)</td>
<td>- 0.015 (0.00) ***</td>
<td>- 0.016 (0.00) ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men &gt; 0.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women &gt; 0.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist circumference (n = 30)</td>
<td>-3.50 (0.81) ***</td>
<td>-3.17 (0.69) ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women &gt; 88 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men &gt; 102 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood pressure (systolic) (mm Hg) ≥140 (n=26)</td>
<td>-10.38 (1.44) ***</td>
<td>- 12.5 (1.91) ***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* (p ≤ 0.05), ** (p ≤ 0.01), *** (p ≤ 0.001)
Summary of changes

- Statistically significant mean changes over 12 and 24 month were identified in a range of clinical parameters for the whole cohort, including body mass index, systolic blood pressure, total cholesterol level, waist circumference and waist hip ratio. Highly significant reductions were recorded in the latter 3 clinical parameters.

- Mean changes in clinical parameters for those participants who were considered ‘at risk’ in the base year were also highly statistically significant.

- Those at risk achieved greater mean reductions in all the five clinical parameters considered compared to the reductions of all participants.

- Most of the reduction in parameter measures occurred during the first year of the project, and that first year reductions were maintained into the second year. Except for cholesterol levels, there were no statistically significant reductions in any of the relevant parameters from year 2 to year 3.

SFF Program Costs 2004 - 06

<table>
<thead>
<tr>
<th></th>
<th>Total Cost</th>
<th>Average Cost Per Person ( n = 97)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Delivery Costs</td>
<td>$105,468</td>
<td>$1,087</td>
</tr>
<tr>
<td>Health Service Utilisation</td>
<td>$14,153</td>
<td>$145</td>
</tr>
<tr>
<td>Participant Costs – Cooking equipment</td>
<td>$3,422</td>
<td>$35</td>
</tr>
<tr>
<td>Participant Costs - Exercise Equipment</td>
<td>$18,164</td>
<td>$187</td>
</tr>
<tr>
<td>Total</td>
<td>$141,189</td>
<td>$1,456</td>
</tr>
</tbody>
</table>
### Cost effectiveness in reducing risk of CVD events over 10 years

<table>
<thead>
<tr>
<th>Participants</th>
<th>Average change in probability of a CVD event</th>
<th>Total change in number of CVD events</th>
<th>Cost per CVD event avoided, total cost attributed to CVD</th>
<th>Cost per CVD event avoided, one-half of total cost attributed to CVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants (n = 97)</td>
<td>- 2.12%</td>
<td>-2.06</td>
<td>$68,052</td>
<td>$34,026</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5 mmol/L (n = 71)</td>
<td>- 4.11%</td>
<td>- 2.92</td>
<td>$48,009</td>
<td>$24,004</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5.5 mmol/L (n = 45)</td>
<td>- 4.75%</td>
<td>- 2.14</td>
<td>$65,509</td>
<td>$32,755</td>
</tr>
<tr>
<td>Participants with total cholesterol above 6.5 mmol/L (n = 15)</td>
<td>- 5.77%</td>
<td>- 0.87</td>
<td>$209,237</td>
<td>$104,619</td>
</tr>
</tbody>
</table>

### Cost effectiveness in terms of life years saved over 10 years - CVD

<table>
<thead>
<tr>
<th>Participants</th>
<th>Mean change in estimated life years over 10 years</th>
<th>Total change in estimated life years over 10 years</th>
<th>Cost per life-year gained, total cost attributed to CVD</th>
<th>Cost per life year gained, one-half of total cost attributed to CVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants (n = 97)</td>
<td>- 0.22%</td>
<td>- 0.21</td>
<td>$618,164</td>
<td>$309,082</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5 mmol/L (n = 71)</td>
<td>- 0.52%</td>
<td>- 0.37</td>
<td>$379,710</td>
<td>$189,855</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5.5 mmol/L (n = 45)</td>
<td>- 0.92%</td>
<td>- 0.41</td>
<td>$338,620</td>
<td>$169,310</td>
</tr>
<tr>
<td>Participants with total cholesterol above 6.5 mmol/L (n = 15)</td>
<td>- 1.2%</td>
<td>- 0.18</td>
<td>$934,593</td>
<td>$467,297</td>
</tr>
</tbody>
</table>
Cost effectiveness in reducing the risk of Type 2 diabetes per year

<table>
<thead>
<tr>
<th>Participants</th>
<th>Mean change in probability of Type 2 diabetes</th>
<th>Total change in cases of Type 2 diabetes</th>
<th>Type 2 diabetes avoided, total cost attributed to diabetes</th>
<th>Type 2 diabetes avoided, one-half of total cost attributed to diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants (n = 97)</td>
<td>0%</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Participants with body mass index ≥ 25 (n=67)</td>
<td>12%</td>
<td>8.04</td>
<td>$17,436</td>
<td>$8,718</td>
</tr>
</tbody>
</table>

Estimated QALYS gained over 10 years - CVD

<table>
<thead>
<tr>
<th>Participants</th>
<th>Undiscounted QALYs gained over 10 years</th>
<th>Discounted QALYs gained over 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants (n = 97)</td>
<td>0.74</td>
<td>0.57</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5 mmol/L (n = 71)</td>
<td>0.89</td>
<td>0.69</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5.5 mmol/L (n = 45)</td>
<td>0.77</td>
<td>0.59</td>
</tr>
<tr>
<td>Participants with total cholesterol above 6.5 mmol/L (n = 15)</td>
<td>0.26</td>
<td>0.20</td>
</tr>
</tbody>
</table>
Estimated cost per QALY gained - CVD

<table>
<thead>
<tr>
<th>Participants</th>
<th>Cost per QALY gained, total cost attributed to CVD</th>
<th>Cost per QALY, one-half of total cost attributed to CVD</th>
<th>Cost per QALY, one-quarter of total cost attributed to CVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants (n = 97)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undiscounted QALYs</td>
<td>$190,795</td>
<td>$95,398</td>
<td>$47,699</td>
</tr>
<tr>
<td>Discounted QALYs</td>
<td>$247,700</td>
<td>$123,850</td>
<td>$61,925</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5 mmol/L (n = 71)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undiscounted QALYs</td>
<td>$158,639</td>
<td>$79,319</td>
<td>$39,659</td>
</tr>
<tr>
<td>Discounted QALYs</td>
<td>$204,622</td>
<td>$102,311</td>
<td>$51,155</td>
</tr>
<tr>
<td>Participants with total cholesterol above 5.5 mmol/L (n = 45)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undiscounted QALYs</td>
<td>$183,362</td>
<td>$91,681</td>
<td>$45,841</td>
</tr>
<tr>
<td>Discounted QALYs</td>
<td>$239,303</td>
<td>$119,652</td>
<td>$59,826</td>
</tr>
<tr>
<td>Participants with total cholesterol above 6.5 mmol/L (n = 15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undiscounted QALYs</td>
<td>$543,035</td>
<td>$271,157</td>
<td>$135,759</td>
</tr>
<tr>
<td>Discounted QALYs</td>
<td>$705,945</td>
<td>$352,973</td>
<td>$176,486</td>
</tr>
</tbody>
</table>

Estimated cost per QALY gained – Type 2 diabetes

<table>
<thead>
<tr>
<th>Participants with body mass index ≥ 25 (n=67)</th>
<th>QALYs gained over 10 years</th>
<th>Cost per QALY gained, total cost attributed to diabetes</th>
<th>Cost per QALY, one-half of total cost attributed to diabetes</th>
<th>Cost per QALY, one-quarter of total cost attributed to diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiscounted QALYs</td>
<td>4.72</td>
<td>$29,912</td>
<td>$14,956</td>
<td>$7,478</td>
</tr>
<tr>
<td>Discounted QALYs</td>
<td>3.64</td>
<td>$38,787</td>
<td>$19,393</td>
<td>$9,397</td>
</tr>
</tbody>
</table>
Estimated cost per QALY gained - CVD and Type 2 diabetes

<table>
<thead>
<tr>
<th></th>
<th>Total QALYs gained over 10 years</th>
<th>Cost per QALY gained, total cost attributed to CVD and diabetes</th>
<th>Cost per QALY, one-half of total cost attributed to CVD and diabetes</th>
<th>Cost per QALY, one-quarter of total cost attributed to CVD and diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiscounted</td>
<td>5.61</td>
<td>$29,912</td>
<td>$14,956</td>
<td>$7,478</td>
</tr>
<tr>
<td>Discounted</td>
<td>4.33</td>
<td>$32,607</td>
<td>$16,304</td>
<td>$8,152</td>
</tr>
</tbody>
</table>

Relative Performance

- A thorough search of the literature was unable to find comparable rural health risk factor projects for comparison, particularly where QALYs gained were reported.

- Drugs, however, are typically listed in the Pharmaceutical Benefits Scheme where cost per QALY is less than $40,000 (George et al, 2000).

- On this basis, regardless of the assumptions about cost attribution, the cost per QALY gained in the SFF project passes this performance threshold.
Conclusions

- Evidence of sustained reductions in a range of clinical parameters for all participants in the SFF project and for those participants considered at risk, as well as the elimination of risk factors that contribute to cardiovascular disease and Type 2 diabetes.

- On at least two measures, the SFF project generates sufficient benefits to society and cost savings to government for it to be considered a worthwhile project. As reported, the SFF project achieves the $40,000 per QALY acceptability threshold, and generates net cost savings to government.


- Sustainable Farm Families www.sustainablefarmfamilies.org.au

Questions

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