The Manitoba Follow-up Study

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- Research Manitoba
- University of Manitoba
- Donations from Study Members and Their Families

I have no conflict of interest to disclose

… Robert Tate

May 11, 2016
The Manitoba Follow up Study

A BRIEF HISTORY
The Manitoba Follow-up Study

- Origin, Design and Conduct of MFUS
- Research Highlights
  - Cardiovascular Epidemiology
  - Understanding Successful Aging
- The Study Members
  - Ownership, Engagement and Support
  - Perception of Participation and Advice
- Academic Collaboration
FAL Mathewson, MD
1905 - 1994

- Graduate of UM Medical School 1931
- Winnipeg General Hospital physician 1935-1975
- Late 1930s with the Canadian Army
- During WWII Deputy Director of RCAF Medical Services
- Medical Director of Great West Life
- HBC Western Canada historian
- Director MFUS to 1988
• RCAF, Pilot Officer and Medical Reserve
• Graduate of UM Medical School 1954
• Dr Mathewson’s summer student
• Section Head of Cardiology, U of M
• Professor Emeritus and Senior Scholar
• Director MFUS from 1988 to 2001
• Director Emeritus of MFUS

TE Cuddy, MD
1930 - 2014
Origin of MFUS

- Initiated by Dr. FAL Mathewson during WWII
- Physical examination of young aircrew recruits during war years
- Survivors contacted between 1946 and 1948
- Housed since 1948 at University of Manitoba
Formation of Cohort

- Cohort sealed July 1, 1948
- 3,983 healthy men
- Mean age 30.1 ± 6.1 years
- 90% were 20 to 39 years of age
- 124 “younger” men were later included at the request of the Department of Transport (DOT)
MFUS Cohort Spans 67 Years

In 1948:
- 3,983 male air recruits
- Mean age 30y
- 90% were 20-39y
- All across Canada
- Free of heart disease

In 2015:
- 298 alive (7.5%)
- Mean age 94y
- 94% are 90y+
- 92% in Canada
- 36% developed IHD
A Prospective Study of Healthy Young Men

Then …

… Now
Dr. Mathewson’s Aim

“Because the suspicion of heart disease, particularly coronary artery disease, may have a far reaching effect upon the individual, it is important to identify beyond any reasonable doubt the clinical significance of those variants that appear in the electrocardiograms of apparently healthy people.”

Circulation 21:196-203, 1960
Study Personnel – Early Years

- Medical technician training centre
- Service personnel “posted” to UM Medical School
- Clerical staff for MFUS
- Summer medical students
Medical Examinations

- Height, weight, blood pressure
- General cardiovascular assessment
- Resting 12 lead electrocardiogram
- Member examined by his personal physician
  - 1948 to 1963 - every 5 years
  - 1963 to 2000 - every 3 years
- Yearly “medical update” since 1978
- More frequent examinations by RCAF and DOT
Annual Contact

From 1948 to 1978 … postcard
  • to confirm vital status and maintain address registry
Since 1978 … one page questionnaire
  • address, alternate contact, medical update
  • trigger inter-examination follow-up
  • signed release for information from hospital or physician
Since 1996 …
  • contact has been increased to twice yearly
Since 2006 …
  • contact has been increased to three times yearly
Periodic Questionnaires

In 1968 and 1974

• Smoking, family history of disease, occupation

In 1982 and 1984

• Physical activity, wartime stress


• Successful Aging Questionnaire (SAQ) including mental, physical and social functioning (SF-36) and a narrative reply to “What is YOUR definition of successful aging?”

Beginning 2007, and annually since…

• Nutritional risk
Data Collected

Annual Contact
• 181,234 person-years of observation

Medical Examinations
• 74,104 Electrocardiograms
• 98,354 Blood pressure/weight
• 93,890 Clinical entries

Questionnaires
• Smoking, activity, war time stress
• ~10,500 Successful Aging
• ~2,600 Nutritional Risk
Research Findings
Chronology of Research Reporting

1950s - Early case series reports, annual reporting
1960s - First analyses of morbidity and mortality
1970s - Natural history of EKG abnormalities
1980s - Relationship of body build and blood pressure to cardiovascular disease and stroke
1990s - Longitudinal analysis and patterns of chronic disease risk factors
2000s - Successful Aging, nutrition
2010s - Successful Aging, perceived control, liver disease, biostatistical methods
Robert Tate (B.Sc., '73, Mathematics, Statistics) is a research associate to a seven-member medical team conducting cardiovascular research. He is responsible for computer programming support and for statistical analysis of data collected over a long term. Prior to joining this team, he completed his M.Sc. (Statistics) at the University of Manitoba.
Cardiovascular Disease
Sixty year Incidence of Ischemic Heart Disease: 1948 to 2008

Incidence per 1,000 pyrs

Five year Age Interval

- Sudden Death
- Myocardial Infarction
- Angina Pectoris

Heartbeat and Love Symbol
The EKGs of 57 young recruits to RCAF were noted to have a prolonged PR Interval (>0.20 sec).

Etiology and consequence was uncertain.

After a mean follow-up of 9 years,
  » there were no deaths, and
  » only one man had experienced a cardiac event

Adapted from: Mathewson FAL, Taylor WJR. Assoc Life Insur Med Dir America 1952.
Possible Factors Associated with Development of IHD

- “General description” of MFUS experience to 1963
- First 210 deaths and 143 cases of IHD
- Gradient of increased risk found for:
  - Non specific S-T and/or T-wave changes
  - Systolic and Diastolic blood pressure
  - But, not average heart rate or body weight

Body Mass Index and Development of IHD

- After 26-years follow-up, 390 men with IHD
- Gradient of increased risk found for Age, SBP, DBP and BMI
- Risk associated with BMI
  - Greatest for Sudden Cardiac Death
  - Greater for younger men, compared to older men

Adapted from: Rabkin SW, Mathewson FAL, Hsu PH. *Am J Cardiol* 1977.
Height as Risk Factor

- Body Mass Index (weight/height$^2$) is a risk factor for IHD.

- Body weight is associated with IHD
- Might height alone be an independent factor as well?
Height as Risk Factor

Adapted from: Krahn AD, Manfreda J, Tate RB, Mathewson FAL, Cuddy TE. Am J Cardiol 1994.
Natural History of Atrial Fibrillation

● Incidence
  » Common rhythm disturbance: 1 in 10 elderly men
  » Can be both persistent and transient

● Risk factors…
  » Hypertension, obesity
  » Prior IHD, Non-specific EKG abnormalities

● Prognosis…
  » 1.3-fold increase in Total Mortality
  » 2.5-fold increase in Stroke
  » But, no increase in Myocardial Infarction

Adapted from: Krahn AD, Manfreda J, Tate RB, Mathewson FAL, Cuddy TE. Am J Medicine 1995.
Effects of Aging on Risk Factors for IHD

- Risk factor profiles change with age
- Incidence of IHD increases with age
- What effect might aging have on the relationship between the two?
Relative Risk of IHD by Age

Adapted from: Tate RB, Manfreda J, Cuddy TE. *Ann Epidemiol* 1998.
Chronobiology of Sudden Cardiac Death

Are some events, such as heart attacks, cancer diagnosis, death, occurring with equal frequency throughout the week?
MFUS Deaths by Day of Week

Cancer

Myocardial Infarction

Sudden Unexpected Cardiac Death

Adapted from: Rabkin SW, Mathewson FAL, Tate RB. JAMA 1980.
Sudden Cardiac Death on Monday - a 60 year update -

Percent of Sudden Cardiac Deaths Occurring on Monday

By Calendar Years

By Age

Tate RB .. unpublished
Healthy and Successful Aging
Expanding MFUS Focus

- … in late 1990s from research based on EKGs, and risk factors for cardiovascular disease, including heart disease, stroke and mortality.
- Today 13% of Canadians are over age 65 years, by 2040, 25% will be over 65 years.
- Move from studying not only chronic disease to quality of life of older Canadian men.
Cicero suggested that in old age the individual should focus on the mind, and not be distracted by bodily needs….

“Nothing [is] more directly destructive to the dignity of man than the pursuit of bodily pleasure.”
North American History of Aging Research

- USA 1944 – American Social Science Research Council “Committee on Social Adjustment to Old Age”

- Havighurst (1961) – “Currently, there are essentially 2 gross theoretical models of successful aging: the activity theory emphasizing the maintenance of the activities and attitudes of middle age, and the disengagement theory, essentially withdraw from active life.”

- Fries (1980) – compression of morbidity, a goal to live life to the fullest, free of disability as long as possible, and decline quickly to death.

- Baltes and Baltes (1990) – SOC model – selection, optimization, compensation. (*** pictorial example to follow ***)

- Rowe and Kahn (1987, 1998) – intersection of three concepts – 1) low physical disease/disability, 2) high cognitive functioning, 3) active engagement with life
Mr F (age 95) in Victoria
Understanding “Successful Aging”

- “Successful Aging” is a desirable state-of-being in later life, indeed throughout life
- Widely used concept, but no universal definition
- Successful Aging has many dimensions: Health, active engagement with life, vitality, resilience, adaptation and acceptance, spirituality, happiness
- For resource planning, we must understand the population’s views about “Successful Aging”
Our First Successful Aging Questionnaire (SAQ)

- MFUS survey developed in spring of 1996
- 1,821 of 2,043 (89%) MFUS members responded after 3 mailings
- Living arrangements, social activities, activity limitations, physical/mental functioning (SF-36)
- Content analysis of narrative responses to: “What is your definition of successful aging?”
First Results in 1996

- 20 different themes of SA were provided:
  - 30% … Health / disease
  - 28% … Happiness / satisfying life
  - 20% … Keeping active physically
  - 19% … Positive outlook / attitude
  - 19% … Family / friends
  - 17% … Independence
  - 10% … Spirituality / growing old gracefully

- Life satisfaction, self-rated health, and activity limitations related to inclusion/omission of specific themes in a definition
Why might individual definitions of SA be important?

- Over 6 years, from 1996 to 2002, 472 (26%) of the 1,821 respondents to the first SAQ, died.
- Four themes from definitions of SA were significantly associated with an increased, i.e. better, survival rate.
Some SA themes lead to better survival over 6 years…
(APHA 2003)

<table>
<thead>
<tr>
<th>Theme in SA Definition</th>
<th>Age Adjusted Relative Survival (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keeping physically active</td>
<td>1.46 (1.12, 1.89)</td>
</tr>
<tr>
<td>Contentment</td>
<td>2.26 (1.01, 5.05)</td>
</tr>
<tr>
<td>Being useful, volunteering</td>
<td>1.84 (1.10, 3.09)</td>
</tr>
<tr>
<td>Having a positive outlook</td>
<td>1.32 (1.02, 1.70)</td>
</tr>
</tbody>
</table>
Successful Aging Questionnaire

Fifteen SAQs have been mailed since 1996. Annual response rates vary from 75% to 89%.

Core questions include:
- Living arrangements, marital status, residence
- Mental, physical and social functioning (SF-36)
- Self-rated health and life satisfaction
- Participation in leisure time activities
- Basic and instrumental activities of daily living
- “What is YOUR definition of successful aging?”
- “Would YOU say you have aged successfully?”
SAQ add-on components

1996: Occupation, retirement
2000: Diet and nutrition
2002: What is ‘being old’? Are you old?
2004: Weight recall, long-term effects of WWII
2005: Changes in diet, driver and pilot licenses
2006: Care-giving, income adequacy
2007: How and why has your SA definition changed?
2008-2014: Importance of items to determine QoL
2010: Diet and nutrition, memory
2011-2012: Psychological control
2013: Advice for Canadian Forces, VAC and CLSA
2014: Personal challenges for future
2015: Frailty
Arrived in the mail ... from Max

Aging
I missed the most important item:
our genes.
One aunt lived to 101
all relatives
lived longer
than what
was the average.

Max
<table>
<thead>
<tr>
<th>Year of Survey</th>
<th>Number of surveys mailed (% returned)</th>
<th>Number of surveys returned with SA definition</th>
<th>Age in years mean ± st dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>2,043 (87%)</td>
<td>1,745</td>
<td>76.6 ± 3.7</td>
</tr>
<tr>
<td>2000</td>
<td>1,661 (81%)</td>
<td>1,319</td>
<td>80.2 ± 3.4</td>
</tr>
<tr>
<td>2002</td>
<td>1,476 (81%)</td>
<td>1,153</td>
<td>82.0 ± 3.3</td>
</tr>
<tr>
<td>2004</td>
<td>1,215 (74%)</td>
<td>870</td>
<td>83.8 ± 3.2</td>
</tr>
<tr>
<td>2005</td>
<td>1,112 (80%)</td>
<td>860</td>
<td>84.6 ± 3.0</td>
</tr>
<tr>
<td>2006</td>
<td>1,001 (84%)</td>
<td>807</td>
<td>85.6 ± 3.1</td>
</tr>
<tr>
<td>2007</td>
<td>881 (80%)</td>
<td>680</td>
<td>86.3 ± 3.0</td>
</tr>
<tr>
<td>2008</td>
<td>757 (81%)</td>
<td>589</td>
<td>87.2 ± 2.9</td>
</tr>
<tr>
<td>2009</td>
<td>667 (83%)</td>
<td>522</td>
<td>88.0 ± 2.8</td>
</tr>
<tr>
<td>2010</td>
<td>581 (83%)</td>
<td>450</td>
<td>88.8 ± 2.8</td>
</tr>
<tr>
<td>2011</td>
<td>467 (81%)</td>
<td>360</td>
<td>89.7 ± 2.9</td>
</tr>
<tr>
<td>2012</td>
<td>387 (87%)</td>
<td>298</td>
<td>90.7 ± 3.0</td>
</tr>
<tr>
<td>2013</td>
<td>330 (79%)</td>
<td>245</td>
<td>91.4 ± 3.0</td>
</tr>
<tr>
<td>Year of Survey</td>
<td>Married %</td>
<td>Aged Successfully? % Yes</td>
<td>Self-rated health % excellent</td>
</tr>
<tr>
<td>---------------</td>
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<tr>
<td>1996</td>
<td>83</td>
<td>88</td>
<td>31</td>
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<td>2000</td>
<td>79</td>
<td>84</td>
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<td>2002</td>
<td>77</td>
<td>87</td>
<td>22</td>
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<td>2004</td>
<td>74</td>
<td>89</td>
<td>14</td>
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<td>2005</td>
<td>71</td>
<td>83</td>
<td>12</td>
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<tr>
<td>2006</td>
<td>69</td>
<td>86</td>
<td>12</td>
</tr>
<tr>
<td>2007</td>
<td>66</td>
<td>80</td>
<td>13</td>
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<td>2008</td>
<td>67</td>
<td>82</td>
<td>12</td>
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<td>2009</td>
<td>66</td>
<td>77</td>
<td>11</td>
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<td>2010</td>
<td>66</td>
<td>77</td>
<td>10</td>
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<tr>
<td>2011</td>
<td>65</td>
<td>84</td>
<td>12</td>
</tr>
<tr>
<td>2012</td>
<td>62</td>
<td>80</td>
<td>11</td>
</tr>
<tr>
<td>2013</td>
<td>60</td>
<td>76</td>
<td>12</td>
</tr>
</tbody>
</table>
Mr D’s (87y) SAQ 2015 response
Mean MCS and PCS (with 95% CI) by Year of Survey

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Surveys</td>
<td>1735</td>
<td>1305</td>
<td>1154</td>
<td>870</td>
<td>859</td>
<td>806</td>
<td>680</td>
</tr>
<tr>
<td>Mean Age</td>
<td>76.5</td>
<td>80.1</td>
<td>82.0</td>
<td>83.8</td>
<td>84.6</td>
<td>85.6</td>
<td>86.3</td>
</tr>
</tbody>
</table>

SF-36 Physical and Mental Functioning Score

MCS

PCS

Year
Multiple Linear Regression Coefficients for Binary SA Themes in Models of PCS and MCS (GSA 2009)

<table>
<thead>
<tr>
<th>Theme in Definition of Successful Aging</th>
<th>Mental Component Score</th>
<th>Physical Component Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient ± SE</td>
<td>Coefficient ± SE</td>
</tr>
<tr>
<td>Mental Health – Attitude</td>
<td>1.06 ± 0.20</td>
<td>-</td>
</tr>
<tr>
<td>Acceptance/Coping</td>
<td>1.03 ± 0.32</td>
<td>-0.63 ± 0.33</td>
</tr>
<tr>
<td>Mental Activity</td>
<td>1.03 ± 0.28</td>
<td>-</td>
</tr>
<tr>
<td>Adaptation</td>
<td>0.93 ± 0.26</td>
<td>0.64 ± 0.32</td>
</tr>
<tr>
<td>Life Experience</td>
<td>0.87 ± 0.43</td>
<td>1.35 ± 0.45</td>
</tr>
<tr>
<td>Mental Health – Happiness</td>
<td>0.82 ± 0.20</td>
<td>-</td>
</tr>
<tr>
<td>Having Interests</td>
<td>0.70 ± 0.20</td>
<td>0.72 ± 0.22</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>0.58 ± 0.24</td>
<td>1.09 ± 0.25</td>
</tr>
<tr>
<td>Independence</td>
<td>0.55 ± 0.20</td>
<td>-</td>
</tr>
</tbody>
</table>
Our SA coding manual…

- The 1996 SAQ narratives identified 20 SA themes
- Expanded to 86 themes
- The 86 themes can be easily grouped into 21 theme categories with multiple themes (e.g. Independence category contains 8 themes)
- Hired and trained a team of 6 summer students in 2011 to recode SAQs
Themes of Successful Aging with Unequal Prevalence over Time: 1996 to 2006
<table>
<thead>
<tr>
<th>Odds Ratio 1.0 to 3.0</th>
<th>Odds Ratio 3.0 to 5.0</th>
<th>Odds Ratio &gt; 5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Happiness</strong></td>
<td><strong>Coping, Adjustment, Acceptance</strong></td>
<td><strong>Life Experience</strong></td>
</tr>
<tr>
<td>1.9 (1.6,2.4)</td>
<td>3.1 (2.0,4.9)</td>
<td>7.7 (3.5,16.7)</td>
</tr>
<tr>
<td><strong>Attitude</strong></td>
<td><strong>Lifestyle</strong></td>
<td><strong>Relationships – Intimate</strong></td>
</tr>
<tr>
<td>2.0 (1.6,2.6)</td>
<td>3.3 (2.2,4.8)</td>
<td>10.4 (0.7,160)</td>
</tr>
<tr>
<td><strong>Independence</strong></td>
<td><strong>Relationships – Society</strong></td>
<td><strong>Quality of Life</strong></td>
</tr>
<tr>
<td>2.1 (1.7,2.7)</td>
<td>3.3 (2.2,5.0)</td>
<td>19.9 (6.7,59.3)</td>
</tr>
<tr>
<td><strong>Health – Physical</strong></td>
<td><strong>Physical Activity</strong></td>
<td><strong>Spirituality</strong></td>
</tr>
<tr>
<td>2.3 (1.6,3.3)</td>
<td>3.4 (2.6,4.4)</td>
<td>24.1 (11.8,49.2)</td>
</tr>
<tr>
<td><strong>Health – Cognitive</strong></td>
<td><strong>Living and Dying</strong></td>
<td></td>
</tr>
<tr>
<td>2.3 (1.5,3.5)</td>
<td>3.5 (2.1,5.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Relationships – Companionship</strong></td>
<td><strong>Relationships – Family</strong></td>
<td></td>
</tr>
<tr>
<td>2.4 (1.7,3.5)</td>
<td>4.2 (3.2,5.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Adaptation</strong></td>
<td><strong>Health – System</strong></td>
<td></td>
</tr>
<tr>
<td>2.4 (1.7,3.6)</td>
<td>4.6 (1.7,12.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Leisure Activity and Interests</strong></td>
<td><strong>Being Productive, Contributing</strong></td>
<td></td>
</tr>
<tr>
<td>2.5 (2.0,3.0)</td>
<td>4.9 (3.0,7.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Health – General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.7 (2.1,3.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In Summary, the MFUS view of SA is …

- Earlier work explored SA as a label, and a goal to strive for.
- Problems arise with a clinician imposed definition of SA.
  - Who decides if I’ve “aged successfully?”
  - If someone tells me I haven’t “aged successfully”, have I “failed”?
  - Clinical criteria tend to underestimate success and mislabel individuals who self-identify as having aged successfully.
- Successful aging has many dimensions … and must be defined by the individual.
- Distributions of SA themes are valuable for planning at the community or population level, but be careful with imposing themes at the individual level.
What we have learned about SA from the MFUS men...

- **SA as a predictor**
  - themes of SA predict mortality, mental and physical functioning.

- **SA as an outcome**
  - individual characteristics predict themes of SA.

- **SA as a dynamic process**
  - although SA themes may change over time, many are highly repeatable at an individual level.
  - an individual may transition “in and out” of self-assessed SA.
Current SA Research at MFUS

- Distinguish between “means” and “ends” of SA in a man’s definition.
- Characterization of individuals whose themes change and do not change over time.
- What events in a man’s life trigger a change in his definition of SA.
- SA themes related to long-term survival and remaining in the community.
Meet a few Study Members
Mr. H in Guelph (age 89)
“Some of my recent creations.
P.S. They are for sale.”
Ralph Connor: a study in good health

Disciplined lifestyle of ex-airman has been followed for 70 years

MARK MCNEIL
The Hamilton Spectator

Ralph Connor is a man with a lot of self-discipline.
He’s 90 years old, with a bad hip that’s scheduled for surgery, but still goes to the YMCA at 5 a.m. three times a week to work out with his buddies.

It’s something he’s been doing for 81 years.
He’s absolutely convinced his exercise regimen — incorporating circuit training and swimming, among other things — along with good genes and a generally healthy diet explain his excellent cardiovascular health and longevity.

And he has some numbers to back that up.

Nearly 70 years ago, he signed up for a cardiovascular disease and aging study of Royal Canadian Air Force airmen who were moving into civilian life after the Second World War. The ongoing research project has turned out to be the longest-running study of cardiovascular disease and aging in Canada.

The study started with 3,983 men. Today, 3,30 are still alive.

“I realized a long time ago that if I didn’t work out early in the morning, I wouldn’t get done,” says the retired insurance broker, who trained pilots with the RCAF during the war.

He says keeping in shape makes him feel better and has allowed him to do things — until recently, before his hip gave him trouble — such as climb onto the roof of his two-storey house and pick acorns out of the eavestrough. He was 89 the last time he did that.

“He’s at the top end, that’s for sure,” says Robert Tate, director of the Manitoba Followup Study, as it is called. “Mr. Connor is in an elite group that has survived to 90 years old. He is a very happy man with his lot in life. He continues to participate in a lot of activities that bring him pleasure and bring his community pleasure, I suspect.”

The research effort was the brain child of Dr. F.A.L. Mathewson, a doctor with a specialty in cardiology, who evaluated the fitness of thousands of recruits for the RCAF during the war.

After the war ended, Mathewson — with assistance from the Canadian military and the University of Manitoba — decided to continue to track the cardiovascular health of the airmen. They had such a tremendous amount of baseline data that it made sense to build on it for a long-term study.

Mathewson, who died in the 1990s, was particularly interested in seeing whether electrocardiogram results that showed slight abnormalities early in life pointed to more serious cardiovascular problems later on, something the study would eventually show to be the case.

Tate says the study also found that 35 per cent of the men deemed healthy in the 1940s would develop cardiovascular disease later on. That’s about the national average.

Smoking and obesity tended to go hand-in-hand with cardiovascular problems among respondents in their 40s or 50s. But if the problem hadn’t shown up by then, the person was no more likely to have cardiovascular disease at an older age than their non-smoking, more physically fit colleagues.

“As expected, people in younger ages who smoke have a greater risk of heart disease later into the future but that risk diminishes with age....”

The magnitude of the effect of smoking in a younger man is much greater than in an older man,” Tate said. “And the same is true with obesity.”

Tate says in more recent years the study has evolved into focusing more on what is being called “successful aging” — the goal of finding physical, mental and social well-being in older age.

“It’s truly a unique opportunity to look at issues related to older men’s lives. We feel that it is a concept defined at an individual level.”

For his part, Connor feels the study is very important, so much so that when funding problems developed many years ago, he put in his own money to help out. Each year, he sends $150 to keep it going.

For the 50th anniversary, he travelled to Manitoba, at his own expense, to take part in a celebration held there for participants.

More recently he celebrated his 90th birthday at, you guessed it, the Y. A room was booked, his buddies were invited. They had cake and all the usual.

Did he work out that day?
“Oh yeah, of course,” he said.

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Mr. B from Rocky Mountain House (age 91)
This RCAF Veteran, says it all...

ANYONE NEED A TAIL GUNNER?
Funding a 67 year Study
Funding: 1946-1983

- Royal Canadian Air Force
- National Research Council of Canada
- Medical Research Council (1961-65)
- Defense Research Board (1962-74)
- Canadian Life Insurance Assoc (1965-75)
- Health and Welfare Canada (1965-83)
Funding: 1984-2000

- 1983 H&W recommend termination of data collection with a contingency to “wind down”
- Study members say “NO”
- MFUS established as a registered charity
- Members form “MFUS-2000” and contribute 75% of operating costs through donations
- Short term pledges obtained from insurance companies, Wartime Pilot and Observers Association, Royal Canadian Legion
Funding: 2001-

- Fewer study members with retirement incomes lead to decline in member contributions
- Veterans Affairs Canada: 2001
- MHRC operating grant to update data systems and enhance follow-up procedures: 2001-2003
- CIHR programmatic grant with renewals: 2003-2011
- Co-investigator funding, local foundations: 2011-2013
- Faculty of Medicine UM: 2014-2015
- Research Manitoba\College of Medicine: 2015-2016
- Continued donations from members and families
Opinions and Advice from MFUS Members..

Short questionnaires were sent in 2003, 2010 and 2014 to ask members’ opinions concerning their participation with this long-term study.
What effect do you think participating in World War II has had on your overall health and well-being? (870 respondents in 2004)

<table>
<thead>
<tr>
<th>Response</th>
<th>Stacks</th>
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<tbody>
<tr>
<td>Very Little</td>
<td></td>
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<tr>
<td>Negative</td>
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<tr>
<td>Positive/Negative</td>
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<tr>
<td>Positive</td>
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<tr>
<td>None</td>
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<td>Don’t Know</td>
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<td>P.O.W.</td>
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</tbody>
</table>
1. Do you feel the time, effort and support you have provided to MFUS have been worthwhile?

- [ ] Yes, very worthwhile
- [ ] Yes, somewhat
- [ ] No, not very
- [ ] No, not at all
- [ ] No opinion

![Bar chart showing responses over time]
2. Do you feel the results of MFUS have contributed to society's better understanding of human health?

- Yes, very much
- Yes, somewhat
- No, not really
- No, not at all
- No opinion
3. Do you feel that participating in this study has had an impact on YOUR OWN HEALTH?

- Yes, definitely
- Yes, probably
- No, probably not
- No, definitely not
- No opinion

In 2014

In 2010

In 2003
4. How much longer do you think MFUS should continue collecting data from study members?

- No longer
- Two more years
- Five more years
- Ten more years
- Until demise of last member
- Other

Graph showing the percentage of responses for each option in 2003, 2010, and 2014.
Value of MFUS

• Healthy outlook of members
• Research contributions to medicine
  ▪ Extends world knowledge concerning heart disease
  ▪ Provides new knowledge in understanding aging
  ▪ First hand research experience for graduate students, medical residents and research trainees
• Database for research and teaching
• Collaboration with other investigators
U Manitoba Co-investigators

- Dr Phil St. John – Functional trajectories and frailty
- Dr Christina Lengyel – Nutrition of Older Adults
- Dr Audrey Swift – Psychology of Perceived Control
- Dr Ruth Barclay – Response Shift and QoL
- Dr Depeng Jiang – Person-oriented methodologies
- Dr Julia Uhanova – MetS and Liver Disease
- Dr Mahmoud Torabi – Longitudinal data analysis
3 MFUS Directors through 67 years

- Photo taken at Dr Mathewson’s home celebrating the presentation of the Wilbur R. Franks Award for “Dedicated Contribution to Aerospace Medical Matters in Canada” March 10, 1992

- The long-term likelihood of success of any cohort study is increased by the dedication of study participants and continuity of committed staff.
The Manitoba Follow up Study

A BRIEF HISTORY