Population Health presentations:

Predictive Modelling Framework for Chronic Disease Management for Australian Capital Territory’s population

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Abstract:
Smart watches/activity trackers and other mobile devices can capture data as steps taken, distance walked, calories expended, heart-rate etc. by utilizing information from heterogeneous sensors, and also allow continuous monitoring of numerous physiological signals. This can be potentially useful in monitoring physical activity and health. We will present a potential predictive analytical model using preliminary findings from a pilot study in the ACT that uses shared activity data from approximately 890 people (300,000 hrs of data). Our predictive modelling framework uses novel machine learning/big data mining approaches based on domain adaptation, for building a collaborative model, that can perform in both static, offline, acute care/reactive settings as well as dynamic, preventative/proactive settings, with data captured from personal wearable devices (Fitbit® and Garmin® trackers). The ACTive Community project is a UC-HRI led research project in collaboration with Data61.

The Independent and Interactive Influences of Local Descriptive Norms and Features of the Built Environment on Change in Cardiometabolic Risk

Authors:
University of Canberra, Australia

Abstract:
Local descriptive norms (LDN; i.e., local prevalence of a behaviour or trait) may shape attitudes that predispose health behaviours, thus influencing chronic disease outcomes. Built environment (BE) features enable predisposed behaviour. This study assessed the independent and interactive effects of LDN for overweight/obesity and BE features in relation to change in glycosylated haemoglobin (HbA1c).

HbA1c was measured three times over 10 years for a population-based adult cohort (n=4056) in Adelaide. Residential environmental exposures were defined using 1600m road-network buffers. LDN for overweight/obesity (body mass index ≥25kg/m2) were compiled from a state-wide surveillance survey. BE measures included walkability, fast food and healthful food availability.

Separate multilevel models included LDN for overweight/obesity with walkability, fast food or healthful food availability, and covariates (area-level education and individual-level age, sex, employment status,
education, marital status, and smoking status). Interactions between LDN for overweight/obesity and BE features were assessed.

HbA1c increased over time. LDN for overweight/obesity were associated with greater rates of increase in HbA1c. Greater walkability was associated with a lesser rate of increase in HbA1c. Fast food and healthful food availability were not associated with change in HbA1c. LDN for overweight/obesity interacted with walkability and healthful food availability. Greater levels of walkability and healthful food availability reduced the adverse effect of elevated LDN for overweight/obesity on HbA1c.

This research highlights the importance of LDN and the multiplicative influence of LDM and BE features that together shape cardiometabolic risk. Multifaceted ecological approaches to population health, including locally targeted social denormalisation strategies, may be warranted.

**Active Living and the Built Environment in the ACT**

**Authors:**
Sarah Robinson, Anthony Burton, Annie Kentwell
Heart Foundation, ACT

**Abstract:**

*Background:* In the ACT, approximately 30% of men and 45% of women are not sufficiently active for health. Integrating incidental and recreational physical activity (active living) into people’s daily lives is an important means to increase physical activity. The physical characteristics of the neighbourhoods in which people live and work (the built environment) can support and provide opportunities that facilitate active living. In the ACT, the Minister for Planning and Land Management is incorporating six active living principles into Canberra’s statutory planning framework (the Territory Plan). ACT evidence is needed to support the ACT Government in identifying disparities in characteristics related to these principles in the ACT.

*Aim:* Describe the urban design and infrastructure characteristics of the different regions in the ACT.

*Methods:* Participants were adult (aged 18+) residents of the ACT who completed the 2015/2016 Urban Wellbeing Survey (n=806). Built environment characteristics examined were related to the six active living principles of the Territory Plan (connected places, open space, mixed land use and density, safe and attractive places, supportive infrastructure, environments for all). Data analyses were undertaken with Statistical Package for Social Sciences (SPSS), Version 21. Chi square tests were used to assess differences in the level of agreement with built environment characteristics across ACT regions.

*Results:* The results of this study suggest there may be differences in some characteristics of the built environment across ACT regions.

*Conclusion:* Further research is needed at the statistical area 2 level to determine suburb level differences in built environment characteristics and the impact on active living.

**The Built Environment is Correlated with Walking Behaviours in the ACT**

**Author:**
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**Abstract:**

Walking is a significant physical activity and is known to be driven by aspects of the built environment. We summarized various aspects of walking behaviours in the ACT using ACT Adult Health Survey data. Then, we
explored the spatial patterns of walking and the built environment correlates of walking in the ACT. Specifically, we explored Design, Density, Diversity, Distance to transit and Destinations (5 Ds) and their relation to the walking environment in Canberra.

We investigated this relationship by examining the overlap of ‘hotspots’ of walking behaviours with hotspots of one built aspect each, from the domains of Design, Diversity, Density, Distance to transit and Destinations. While three of the domains display overlapping clusters in one area of the ACT- Civic, we find no hotspots of Diversity and the hotspot of Design lies in Gungahlin.

Our results demonstrate the importance of the built environment in driving walking behaviours, in addition to the salience of the location and age of the built environment in influencing these behaviours.

Digital Self-Tracking Devices for Health and Fitness Activities: Why and How Do People Use Them?
Author:
Deborah Lupton
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Abstract:
There is now an extensive range of digital devices and software for people to monitor their health and physical fitness activities. Apps, fitness platforms and wearable devices enable users to self-track such features as their heart rate, body weight, body temperature, calories expended, exertion levels, steps taken and kilometres covered.

In this presentation, I will discuss the findings from two sociological projects on Australians’ use of such self-tracking devices. The first involved one-to-one interviews with cyclists in Canberra and Melbourne who used digital devices such as smartphones and bike computers to track their rides and apps and platforms like Strava and MapMyRide to record details and monitor their progress.

The second project involved qualitative telephone interviews with people around Australia who engaged in various forms of self-tracking, including those with chronic health conditions as well as people seeking to improve their physical activity or lose weight. In the presentation, I report on some of the findings demonstrating why and how the participants in these projects engage in these self-tracking activities. I will focus on what people are seeking to achieve with these activities and how they use the personal information about their bodies and lifestyles and incorporate this information into their everyday lives. I will also discuss some of the frustrations, disappointments and concerns about data privacy and security expressed by the participants.

Geographical Convergence of Obesity, Cardiovascular Disease and Type 2 Diabetes: A New Approach to Inform Policy
Authors:
Kayla Smurthwaite and Nasser Bagheri
The Australian National University
Abstract:
Background: On a global scale, chronic disease is increasing to an alarming rate. Examination of local geographical variation will enable policy makers to implement prevention strategies and identify inequalities in health outcomes.
Objectives: To determine the geographical variation of obesity, CVD and type 2 diabetes, using general practice clinical data. Further, to identify regions of significantly high and low clusters of these conditions, and their association with sociodemographic characteristics, in an Australian community.

Research Methods: A cross-sectional approach was used to determine the rate of obesity, CVD and type 2 diabetes in the Adelaide City community. The local Moran I method was used to identify significant hotspots (clusters) of these three conditions in the study region. Additionally, we used the Pearson Correlation Test to determine the association between clusters of these conditions and related risk factors, including socioeconomic status, smoking history and alcohol consumption.

Major Findings: We found three main disease hotspots in the Adelaide City community, where high rates of obesity, CVD and type 2 diabetes converged. The frequency of the three conditions showed an inverse relationship with socioeconomic status. CVD and type 2 diabetes had a higher rate in individuals who smoked or consumed alcohol.

Conclusions: Identification of significant disease clusters will help policy makers to target prevention strategies at the right people, at the right location. The approach taken in this study can be applied to identify hotspots of chronic disease across the world, wherever researchers have access to clinical data.

Neighborhood Walkability and Hospital Treatment Costs: A First Assessment

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Abstract:
Health system expenditure is a global concern, with hospital cost a major component. Built environment has been found to affect physical activity and health outcomes. The purpose of the study was a first assessment of the relationship between neighborhood walkability and hospital treatment costs. For 88 neighborhoods in the Australian Capital Territory (ACT), 2011-2013, a total of 30,690 hospital admissions for the treatment of four diagnostic groups (cancers, endocrine, nutritional and metabolic diseases, circulatory diseases and respiratory diseases) were extracted from the ACT admitted patient care database and analysed in relation to the Walk Score® index as a measure of walkability. Hospital cost was calculated according to the cost weight of the diagnosis related group assigned to each admission. Linear regressions were used to analyse the associations of walkability with hospital cost per person, admissions per person and cost per admission at the neighborhood level.
An inverse association with neighborhood walkability was found for cost per person and admissions per person, but not cost per admission. After adjusting for age, sex and socioeconomic status, a 20-unit increase in walkability was associated with 12.1% (95% CI: 7.1-17.0%) lower cost and 12.5% (8.1-17.0%) fewer admissions. These associations did not vary by neighborhood socioeconomic status.

This exploratory analysis suggests the potential for improved population health and reduced hospital cost with greater neighborhood walkability. Further research should replicate the analysis with data from other urban settings, and focus on the behavioral mechanisms underlying the inverse walkability-hospital cost association.
Incorporating Active Living Principles into Statutory Planning: A successful case study within Canberra, Australia

Authors:
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1 Anthony Burton & Associates, Canberra Australia
2 National Heart Foundation (ACT), Canberra Australia
3 Canberra Urban and Regional Futures, Faculty of Art and Design, University of Canberra, Canberra Australia

Abstract:

Background: The vision for Canberra is to be a healthy, active city that is well connected, compact and equitable. To deliver this vision, the ACT Government is implementing specific changes to its statutory plan, the “Territory Plan”, to mandate the inclusion of active living principles into all developments.

Description: The Heart Foundation worked with the ACT Government, industry and university sector to define six active living principles. A line-by-line Territory Plan Gap Analysis was then undertaken identifying potential changes to the statutory plan.

Sixty-three recommendations for incorporating Active Living Principles into the Territory Plan were developed following seven broad categories:

- Revise the Statement of Strategic Directions;
- Incorporate Active Living Principles into all zone objectives;
- Amend the relevant rules and criteria in all zones;
- Include character statements in Precinct Codes to support active living;
- Review and update General Codes that relate to active living;
- Include active living terminology within the Territory Plan Definitions; and
- Amend the relevant rules and criteria in the Estate Development Code.

The ACT Government has accepted most these recommendations and has written Draft Variation 348: Incorporating Active Living into the Territory Plan.

Lessons Learned: There are three crucial lessons in incorporating active living into statutory planning:

- Collaboration between government and non-government organisations are an effective tool for implementing government change;
- Skilful advocates supported by strong evidence, need to build ongoing trusting relationships with key decision makers to effect change; and
- There is an appetite to fight chronic disease through changes to the built environment and codification is seen by politicians and planners as readily available, effective and implementable tool to achieve this.

Conclusions: It is possible to incorporate health and active living into statutory planning given time, commitment and resources.

Support/Funding Source: This research was undertaken with the generous support of The Australian Capital Territory Government.
Clinical presentations:

How does the time of presentation of chest pain affect patient length of stay? An analysis of a modern chest pain unit.

Authors: Meng Tsay, Mohammad Paymard, Rowan Bassett, Paul Marley, Karen Simpson, Ren Tan, Walter Abhayaratna, Simon O'Connor

Abstract:

Background: Coronary artery disease remains a leading cause of morbidity and mortality worldwide. Patient awareness, combined with media campaigns that encourage early recognition and assessment of chest pain, have led to chest pain being the second most common cause of Emergency Department (ED) presentations Australia-wide, contributing to busier EDs and increased costs. To manage this, our chest pain evaluation unit (CPEU) provides streamlined access to specialty assessment of these patients. We sought to assess the effect of the time of patient presentation to ED and the length of time to discharge.

Methods: Data were collected prospectively on patients referred to CPEU from May 2013 to June 2016, including ED and CPEU admission and discharge times. Admission times to ED were categorised into working-hours (WH, 0800-1700hrs), after-hours (AH, 1701-2359hrs) or after midnight (AM, 0000-0759hrs).

Results: Of the 3586 presentations, 2037 (57%) presented in WH; 939 (26%) in AH and 610 (17%) AM. Patients who presented in WH had the shortest length of stay (7.9h±4.9) compared to those AH (10.4h±5.9) or AM (8.7h±4.5) (p<0.001). ED length of stay remained relatively constant (2.9h±4.7) regardless of time of presentation (p=0.440).

Conclusions: Presentation to ED with chest pain outside of working hours appears to increase the total length of stay in our CPEU, but not within the ED. This result may reflect CPEU staffing or process issues outside of normal working hours. Further evaluation is required to continuously improve the quality of care in CPEU in a cost-effective and patient-centred manner.

Utilisation, uptake and outcomes of the Cardiac Rehabilitation Program at The Canberra Hospital.

Authors: Margaret McManus 1, Donella Proud, Michelle Lander, Jane Colman, Karen Butcher, Ahmad Farshid. 1 Canberra Hospital, Woden, ACT, Australia.

Abstract:

Aim: The aim of the study was to determine participation rates, ascertain barriers and evaluate the effectiveness of Cardiac Rehabilitation (CR) in the ACT.

Method: Patients who had been admitted to Canberra hospital with a diagnosis of Coronary Artery Disease (CAD) were enrolled in the study. Data was collected on patients before and after attending a 6 week Cardiac Rehabilitation program. Clinical outcomes measured included: Weight/girth, blood pressure mean, lipid levels, 6 min walk test, exercise habit, PHQ9 scores and medication compliance.

Results: Currently 201 patients are enrolled in the study and data available on 94 of those patients. After attending the Cardiac Rehabilitation program results include:

- Mean weight decreased from 87.9 to 85.1kg (P<0.0001)
- Minutes of weekly exercise increased from 103.3 to 266.8 min (p<0.0001)
- LDL was reduced to a mean of 1.87 after CR (p<0.0001)
- Mean HDL increased to a mean of 1.17 after CR (p <0.0063)
• Diastolic blood pressure reduced to 69.1 after CR (p < 0.0001)

Patient declines accounted to 23% of patients with main reasons of not attending included work commitments 43%, own exercise program 17% and transport 9%.

**Conclusion:** The study indicated that Cardiac Rehabilitation programs impact on weight loss, exercise, blood pressure and lipid levels. A number of patients decline to attend, although these programs have beneficial outcomes in patients with CAD.

The 3P Pod empowering patients in the waiting room

**Author:**
Dr Paresh Dawda

**Abstract**

**Background:** GP databases lack the recording of data related to determinants of chronic diseases leading to missed opportunities for prevention and well-being interventions. An opportunity exists whilst patients are waiting to see a health care professional to use digital technology to capture such patient data in a clinic waiting room and begin the journey of motivating patients to engage in preventative activities. An interactive waiting room kiosk was co-designed, co-developed and co-deployed by a multidisciplinary team as a mechanism to realise this opportunity.

**Aims:** To pilot the kioskpod and assess its acceptability and ability to (i) improve practice data on lifestyle risk factors for chronic disease (ii) empower patients by providing a personalised health ‘report card’ and signposting to other health-related resources.

**Method:** Focus groups and interactive workshops were conducted during a co-design process to optimise patient and staff experience. Focus groups and interactive co-design workshops were conducted with health professionals, design students and end users to design and develop a pod and process to optimise patient and staff experience. Four software modules were deployed (i) a basic health check (ii) diabetes risk assessment (DRAT) (iii) physical activity assessment and (iv) alcohol consumption. Adult patients attending the clinic between April and October 2016 were invited to use the kiosk. Patient data entered in the kiosk were analysed and compared with existing data on the practice’s clinical system. A purposive sample of consenting staff and patients were interviewed/surveyed.

**Results:**

- Number of patients = 250 adults (April-October 2016), return users = 23
- All four modules = 38%
- Age range = 18-87, median age 39 years
- Male: Female 42%:58%
- Smokers: 13.3% (15% new data)
- BMI: obese 22.5%; overweight 36.5% (59% new data)
- Alcohol: 37.4% unsafe levels (41% new data)
- DRAT: high risk 38%, intermediate risk 35% (96% new data)
- Physical inactivity: 23% (100% new data)
- Key messages from interviews

**Conclusion:** The opportunity to improve care was mostly apparent for physical activity, diabetes risk assessment, BMI and alcohol consumption whereas smoking data offered the least opportunity. Such a kiosk is acceptable to patients and can motivate them although a younger cohort is more likely to use it. The integration of a kiosk into a practice’s patient flow and with the clinical system would enhance and add further value.
High-intensity interval training versus continuous moderate intensity training: Effects on health outcomes and cardiometabolic disease risk factors in cancer survivors: A pilot study

Author:
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Abstract:

Purpose: After determining that physical activity (PA) levels decrease after a cancer diagnosis, a pilot study was conducted to determine the effects of low-volume high-intensity interval training and continuous low to moderate intensity training on quality of life, functional capacity and cardiovascular disease risk factors in cancer survivors.

Methods: Cancer survivors within 24 months post-diagnosis were randomly assigned into the low-volume high-intensity interval training group (n=8) or the continuous low to moderate intensity training group (n=8) group for 36 sessions (12 weeks) of supervised exercise. The low-volume high-intensity interval training (LVHIIT) group performed 7×30 s intervals (≥85% maximal heart rate) and the continuous low to moderate intensity training (CLMIT) group performed continuous aerobic training for 20 min (≤55% maximal heart rate) on a stationary bike or treadmill.

Results: Significant improvements (time) were observed for 13 of the 23 dependent variables (ES 0.05–0.61, p≤0.05). An interaction effect was observed for six minute walk test (18.53% [32.43–4.63] ES 0.50, p≤0.01) with the LVHIIT group demonstrating greater improvements.

Conclusion: These preliminary findings suggest that both interventions can induce improvements in quality of life, functional capacity and selected cardiovascular disease risk factors. The LVHIIT program was well tolerated by the participants and our results suggest that LVHIIT is the preferred modality to improve fitness (6MWT); it remains to be seen which intervention elicits the most clinically relevant outcomes for patients. A larger sample size with a control group is required to confirm the significance of these findings.

Cardiac Rehabilitation and the Active Couch Potato Phenomenon: Move Less, Sit More

Authors:
Dr Nicole Freene (University of Canberra), Dr Borja del Pozo Cruz (University of Auckland), Prof Rachel Davey (University of Canberra), Ms Margaret McManus (Canberra Hospital), Dr Ren Tan (Canberra Hospital), Ms Tarryn Mair (Canberra Hospital)

Abstract:

Aim: To examine the level of physical activity (PA) and sedentary behaviour (SB) in participants attending cardiac rehabilitation (CR).

Methods: Using a prospective cohort study design, 73 adults (44-82 years old, mean age 64 years) commenced a 6-week phase II hospital-based CR program with stable coronary heart disease +/- revascularisation. Outcomes collected at baseline and 6-weeks included PA (Active Australia Survey, accelerometry), SB (Past-Day Adults’ Sedentary Time questionnaire, accelerometry), body mass index, waist-to-hip ratio, lipid profile, blood glucose level, quality-of-life (QoL; MacNew), anxiety and depression (Hospital Anxiety and Depression Scale), and exercise capacity (6-minute walk test).

Results: Participants were predominantly male (79%), born in Australia (66%), tertiary educated (71%) and in a relationship (70%). Percutaneous coronary intervention was the main admission diagnosis (81%). Exercise capacity, blood pressure and QoL significantly improved at the end of CR (p≤0.05). However, time spent in moderate-to-vigorous PA (MVPA) and SB did not change. Accelerometry found that only 16% (95%
CI: 7%, 25%) of the participants were ‘sufficiently’ active (150 minutes MVPA and 5 sessions per week) at 6-weeks. On average, participants spent 11.8 (SD 1.1) hours/day in SB, with 9.60 (SD 14.79) minutes/day spent in MVPA, at the end of the 6-week CR program.

**Conclusion:** The results suggest that PA levels are low and SB is high in CR participants, despite changes in exercise capacity over 6-weeks. Alternatives approaches in CR need to be considered to encourage participants to move more and sit less.

**Does psychological distress increase the risk ischaemic heart disease after accounting for undiagnosed disease? Evidence from a large prospective cohort study**

**Authors:** Jennifer Welsh, Rosemary Korda, Grace Joshy and Emily Banks

**Abstract:**

**Background:** Ischaemic heart disease (IHD) is elevated in people with psychological distress. It is unclear how much of this relationship is causal, as it may reflect psychological distress caused by undiagnosed disease (reverse causality or the “feeling lousy” hypothesis). We quantified the risk of IHD in relation to psychological distress after accounting for two indicators of undiagnosed disease—functional limitation and self-rated health.

**Methods:** Questionnaire data (2006-2009) from 45 and Up Study participants without previous cardiovascular disease were linked to hospitalisation and mortality data (to Dec 2013). Hazard ratios (HRs) for incident IHD (IHD-related hospitalisation or death) were estimated comparing low (10-<12), mild (12-<16), moderate (16-<22) and high (22-50) psychological distress, adjusting for personal characteristics. HRs were estimated for the total sample and then on samples restricted to those without indicators of undiagnosed disease (no or minor functional limitations, or very good or excellent self-rated health).

**Results:** Among 150,268 eligible respondents, 5,158 incident IHD events occurred over 850,929 person-years (rate: 6.06/1000py). In the total sample, IHD risk was increased with mild (HR 1.15, 95%CI 1.08-1.22) moderate (1.26, 1.16-1.37) and high (1.39, 1.24-1.56) versus low distress. However, the excess risk reduced in those without indicators of undiagnosed disease; the IHD HR for mild, moderate and high distress dropped to 1.11(1.02-1.20), 1.20(1.07-1.36) and 1.24(1.02-1.51), respectively, in respondents no or minor functional limitations and 1.07(0.98-1.16), 1.16(1.01-1.34) and 1.24(0.95-1.60) in respondents with very good or excellent self-rated health.

**Conclusion:** Psychological distress is only weakly associated with IHD once reverse causality is taken into account.

**Absolute CVD risk assessment at Winnunga Nimmityjah Aboriginal Health Service**

**Authors:** Xavier Fitzgerald, Ana Herceg, Kirsty Douglas, Nadeem Siddiqui

**Abstract:**

**Introduction:** This study was a retrospective clinical audit assessing the prevalence and management of high absolute cardiovascular disease (CVD) risk among Aboriginal and Torres Strait Islander clients at Winnunga Nimmityjah Aboriginal Health Service (Winnunga). The study also aimed to compare the outcomes of the Central Australian Rural Practitioners Association (CARPA) and National Vascular Disease Prevention Alliance (NVDPA) – Framingham CVD risk calculators. The CARPA calculator adds five percentage points to all NVDPA-Framingham scores for Aboriginal people.
Methods: Information was extracted from the Winnunga electronic medical record system for all Aboriginal and Torres Strait Islander regular clients aged 35-74 years without known CVD (n=1057). For clients where all the necessary measures were recorded in the two years prior to 31 December 2017, CVD risk scores were calculated using both calculators. Prescription of lipid lowering medications was assessed for clients with high CVD risk. Clients with high risk scores were reviewed by the Director of Clinical Services.

Results: There were 362 (34.4%) clients where CVD risk scores could be calculated. The NVDPA-Framingham calculator identified 64 clients (17.7%) as high risk, while the CARPA calculator identified 86 (23.8%). 52 of these clients (14.4%) had clinically identifiable high risk. More than 30% of those with high risk were not on lipid lowering medications.

Discussion: The CARPA and NVDPA-Framingham calculators produce very different results for the same group of people. It is unclear which calculator is most applicable for an urban Aboriginal and Torres Strait Islander population. Many clients with high CVD risk can be identified clinically but may not be managed based on their absolute CVD risk. Use of CVD risk assessment at Winnunga could be increased.

The role of childhood depressive symptoms in the risk for cardiovascular disease: Findings from the LOOK study

Authors:
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Abstract:
Background: Depression constitutes a major risk factor for cardiovascular disease (CVD) in adults. This longitudinal study investigated the effects of depression on prognostic cardiovascular measures and behavioural risk factors in a cohort of Australian children.

Methods: Between the ages of 7 and 17 years, 852 children from the LOOK study completed measures of depression (Children’s Depression Inventory), endothelial function (EndoPAT), cardio-respiratory fitness (20m multistage shuttle run) and percent body fat (DEXA).

Findings: General linear mixed models indicated that children with greater depressive symptoms had significantly lower fitness, and greater percent body fat but there was no evidence of any effect on endothelial function.

Discussion: Children as young as 7-years are already experiencing depressive symptoms, and more so in less fit and fatter children. Although we did not uncover any direct impact on cardiovascular function, given the risks associated with low fitness and obesity, depression in childhood may be exerting an early impact on the risk of developing CVD in later life.