Input papers -2

Study on Health co-benefits to promote energy efficient housing retrofit in Japan

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Household CO₂ emissions toward 2050

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Ikaga Lab., Keio University
Energy Use in Residential Sector & Winter Death

2009 Annual Report of the Chief Medical Officer, Dept. of Health, UK

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Ikaga Lab., Keio University
Excess winter mortality by prefecture in Japan

1.27 million death in a year and 0.47 million death in winter 2014

25% in Tochigi

10% in Hokkaido

High insulated Homes could reduce EWM?

Excess winter mortality

17.5% all over Japan

Proportion of high insulated Homes

23.9% all over Japan


Ikaga Lab., Keio University
Smart Wellness Housing Survey on Changes in Residents’ Health by Insulation Retrofit of Houses in Japan: Study Profiles of Non-Randomized Controlled Trial

Supported by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
Intervention study on insulation retrofits of 1800 homes and 3600 residents’ health in Japan

Before & after retrofit study

- Houses due for a retrofit in 1-2 years: 1800
- Energy-saving standard
  - S standard
  - A standard
  - Less than A standard
- Random sampling: 400

Long-term cohort study

- Plan to collect data on insulation and health by follow-up examinations within the next decade

Follow-up

- Ikaga Lab., Keio University

2014-2017 | 2015-2018 | 2019-

- Home blood pressure
  - Wake time, bedtime
- Physical activity
  - Pedometer, EX, calories
- Temperature, humidity
  - Living, bedroom, bathroom, near floor
- Questionnaire survey on health maintenance
Living room air temperature in winter

Average Living room air temperature (°C)

Minimum Living room air temperature (°C)

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Bed/ Dressing room air temperature in winter

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Multilevel model of morning systolic blood pressure

(Male, 57 years old)

※その他の変数は、本調査で得られた平均的な男性のデータをモデルに投入
野菜（よく食べる）、運動（なし）、喫煙（なし）、飲酒（毎日）、降圧剤（なし）、BMI/塩分チェック得点/睡眠の質/睡眠時間/前夜の飲酒有無（男性調査対象者の平均値を投入）、外気温（全調査対象者の平均値を投入）

morning systolic blood pressure (SBP)

30歳の時点では
4.5mmHg上昇/20℃→10℃

60歳の時点では
8.5mmHg上昇/20℃→10℃

80歳の時点では
11.2mmHg上昇/20℃→10℃

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野菜（よく食べる）、運動（なし）、喫煙（なし）、飲酒（毎日）、降圧剤（なし）、BMI/塩分チェック得点/睡眠の質/睡眠時間/前夜の飲酒有無（男性調査対象者の平均値を投入）、外気温/居間寝室温度差（全調査対象者の平均値を投入）

SBP decrease after insulation retrofit

**Before retrofit**

**After retrofit**

### Table: Regressions of morning systolic blood pressure [mmHg]

<table>
<thead>
<tr>
<th>説明変数</th>
<th>選択肢</th>
<th>モデル1 (室温投入なし)</th>
<th>モデル2 (周囲室温投入)</th>
<th>モデル3 (周囲室温投入)</th>
</tr>
</thead>
<tbody>
<tr>
<td>改修</td>
<td>断熱改修</td>
<td>[1]改修なし→あり</td>
<td>-2.1 **</td>
<td>-1.9 *</td>
</tr>
<tr>
<td>気温</td>
<td>室温変化量</td>
<td>( )℃</td>
<td>-0.37 **</td>
<td>-0.69 **</td>
</tr>
<tr>
<td></td>
<td>外気温変化量</td>
<td>( )℃</td>
<td>-0.09 n.s.</td>
<td>0.05 n.s.</td>
</tr>
</tbody>
</table>

Adjusting for 年齢、BMI、世帯所得、塩分チェック得点、野菜摂取、汗かく運動、喫煙、飲酒、ピッツバーグ得点の変化量

n = 497  *p<0.05, **p<0.01
Healthy Japan 21 excludes warm home

In Healthy Japan 21, “a reduction in average systolic blood pressure by 4 mm" prevents an estimated 15,000 deaths from cardiovascular disease over a year.

- **Nutrition and dietary**: -2.3 mmHg
- **Physical activity**: -1.5 mmHg
- **Alcohol drinking**: -0.12 mmHg

-4 mm by improvement of life-style

- **Hypertension**: -1.8 mmHg by housing insulation

- **Tobacco smoking**: -1.8 mmHg

- **Rest**: -1.8 mmHg

- **Warm home**: Prevents 7,000 deaths additionally


Ikaga Lab., Keio University
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Field survey on Impact of living environments on brain, cardiovascular, respiratory and locomotive system, and co-benefit evaluation of disease and long-term care prevention

**STEP1 Baseline study**
- Office, School
  - Workplace productivity, Presenteeism
- Home
  - Fatigue recovery
  - Mental stress
- Blood pressure, Sleep efficiency, physical activity etc.

**STEP2 Cohort / Intervention study**
- Prospective cohort study
  - Onset of disease or long-term care
  - Died
- Retrospective cohort study
  - Care facility, Hospital

**STEP3 Co-benefit evaluation of disease/care prevention**
- Cardio meter
- Physical activity meter
- Electroencephalogram
- Sleep meter
- Home blood pressure monitor
- Questionnaire survey
- Medical examination
- Magnetic resonance image scanner
- Thermo-hygrometer