Cities and Cardiovascular Health: Heart Healthy Hoods project

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University of Alcalá.

Johns Hopkins Bloomberg School of Public Health.
Cardiovascular Health

Social Environment

Physical Environment

HEART HEALTHY HOODS
Cardiovascular Health

First cause of death in Europe (47% of all deaths in 2010)

Increasing prevalence (50 mill. patients in 2009 in Europe)

Rising social and economic costs (196 billion € in 2009)

Traditional medical preventive approaches are individual

Social Epidemiology

Studies social determinants of disease

Methodologies from Social Sciences and Public Health

Focus on population preventive approach

Addresses growing social inequalities in health
Social Environment

Physical Environment

Individual Cardiovascular Health

Neighborhood Socioeconomic Status
- Unemployment
- Education
- Poverty
- Immigration Composition

Tobacco Environment

Physical Activity Environment

Food Environment

Alcohol Environment

Smoking

Alcohol

dyslipidemia

hypertension

diabetes

Diet

Physical Activity

obesity

HHH main Goal
Secondary Objectives

1. To include a **qualitative approach to understand the context and meanings** of the urban environment in relation to cardiovascular health.

2. To develop **measurements to characterize the social and physical urban environments** in a systematic and accurate fashion.

3. To **understand** the already known relation between the urban environment and cardiovascular health in the United States with this relation in Europe.
To provide scientific evidence to researchers, the general population and policy makers to intervene at the population level to prevent the first cause of death in Europe.

**R&I impact:** Methods, articles, conferences.

**Social impact:** Participation, communication, policy making
21 Districts

128 Neighborhoods

2,412 Census Sections (≈1,500 ps)

3,2 Mill. Residents
HHH Study Design

**Cohort Study**

- Baseline visit
  - 2,576 participants

**WPS EHR**

- 1st Data Mining
  - 1.4 million people

**Final visit**

**Final Data Mining**

**MULTILEVEL ANALYSIS**

- **Environment**
  - Physical
  - Social

- **1st Assessment**
- **Final Assessment**

[http://hhhproject.eu](http://hhhproject.eu)
Overall Objective

To describe **CV profile** of adult population (40-75 years) from the city of Madrid. Likewise, to investigate the **association** between social and physical features of the **urban environment** with citizens’ **CV health**.
Secondary Objectives

1. To describe CVD annual incidence

2. To describe behavioral and biological risk factors prevalence and incidence

3. To study the Whole-Population results as compared to HHH Cohort results
Main Objective

To study the association between environment characteristics and diet, smoking, physical activity, alcohol consumption, and cardiovascular risk
Cohort Study

128 Primary health care centers

31 participating primary care centers

370 Physicians and nurses trained
Cohort Study

**Target Population**

♀♂ between 40 - 75 years old

Free of cardiovascular disease

Residents of Madrid city Origin:
Ecuador, Colombia, Perú y Bolivia

**Variables**

- Clinical visit
  - Biological cardiovascular risk factors
- Telephone survey
  - Behavioral cardiovascular risk factors
a) **Exploratory Study in a Median Area of Madrid**

b) **Urban Environment Exposure Measures**
   i. Food
   ii. Physical Activity
   iii. Tobacco
   iv. Alcohol

c) **Results by working groups**
   i. Health Geography
   ii. Qualitative Research
a) **Exploratory Study in a Median Area of Madrid**

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Exploratory Study

Population cardiovascular health and urban environments: the Heart Healthy Hoods exploratory study in Madrid, Spain

Usama Bilal¹,², Julia Díez¹, Silvia Alfayate¹, Pedro Gullón¹,³, Isabel del Cura⁴,⁵,⁶, Francisco Escobar⁷, María Sandín¹, Manuel Franco¹,²* and the HHH Research Group

Aim

To conduct an exploratory study to provide an in-depth characterization of a neighborhood’s social and physical environment in relation to cardiovascular health.
Exploratory Study

Methods

Mixed Methods Approach

**QUALITATIVE METHODS**
- 11 semi-structured interviews with key informants
- Questions on health and the target environments
- Analysis by triangulation incorporating an interpretative phenomenological analysis.

**QUANTITATIVE METHODS**
- Cardiovascular Disease
  - Electronic Health Records
- Urban Environment
  - Audits tool
  - Food
  - Physical activity
  - Tobacco
  - Alcohol
  - Points of sale

http://hhhproject.eu
Exploratory Study

Results

- Total Pilot Area Population: 15,751
- 95% of population (14,857) registered in Electronic Health Record
  - Possibility of analyzing data for 1.4 million people
- Cardiovascular and risk factor profile:
  - Population 45-106 yrs. old: 7,252
  - Diabetes Prevalence: 12%
  - Diabetes Control (HbA1c<7): 63%
  - Hypertension Prevalence: 34%
  - Dyslipidemia, all types: 32%
**Exploratory Study**

**Results**

- **Build environment**
  - 44 small food stores
  - Large food market (112 stalls)
  - 91 Alcohol outlets (53 bars and restaurants)
  - 64 Tobacco outlets

- **Social environment**
  - Drinking as a socialization mechanism
  - Public open spaces mostly used by seniors
  - Importance of accessibility
  - Availability of destinations to walk
HHH Methods and Results

a) Exploratory Study in a Median Area of Madrid

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Exposure measures

Field-work areas selection

- SE district study (N=21)
- 2 neighborhoods according SE characteristics (N=42)
- “median” census section (N=42)

Field-work audit tools

- FOOD \(\rightarrow\) NEMS-S
- ALCOHOL \(\rightarrow\) OHCITIES
- TOBACCO \(\rightarrow\) TOBACCO Questionary
- PHYSICAL ACTIVITY \(\rightarrow\) WALKABILITY

Secondary databases

- Census of commercial activities and establishments
- Socio-demographic (census and “padrón”)
- Commissioner for the Tobacco Market
- Spatial Data

http://hhhpjproject.eu
HHH Methods and Results

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Field validation of municipal food environment data to characterize retail food environments in Madrid

(Work in progress)
Díez J., Bilal, U., Cebrecos, A., Pérez, H., Galán, I. and Franco M

Aim

- To examine whether municipal data are a valid alternative to ground-truthing when characterizing the retail food environment in a Southern Mediterranean city like Madrid, Spain.
- To test whether indicators of validity differed by area-level deprivation.
## Validation results

➢ Municipal database has been validated

<table>
<thead>
<tr>
<th>Type of store</th>
<th>Sensitivity</th>
<th>95% CI</th>
<th>PPV</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All food stores</td>
<td>89.7%</td>
<td>82.8% , 94.6%</td>
<td>55.3%</td>
<td>47.9% , 62.5%</td>
</tr>
<tr>
<td>Supermarkets</td>
<td>100.0%</td>
<td>83.9% , 100.0%</td>
<td>91.3%</td>
<td>72.0% , 98.9%</td>
</tr>
<tr>
<td>Small grocery</td>
<td>86.7%</td>
<td>73.2% , 94.9%</td>
<td>59.1%</td>
<td>46.3% , 71.0%</td>
</tr>
<tr>
<td>Convenience</td>
<td>100.0%</td>
<td>87.0% , 100.0%</td>
<td>100.0%</td>
<td>87.0% , 100.0%</td>
</tr>
<tr>
<td>Specialized</td>
<td>87.5%</td>
<td>74.8% , 95.3%</td>
<td>42.9%</td>
<td>32.9% , 53.3%</td>
</tr>
</tbody>
</table>

➢ Non bias by socioeconomic level
Validation results

➢ Municipal database has been validated

➢ Non bias by socioeconomic level

Exposure Measures

Food

VALIDATION ALGORITHM

Unspecialized food store

Yes

47.11.03?

No

47.1?

Yes

Supermarket name?

No

More than one

47.2?

Yes

Specialized store

No

Small grocery store

No

Other store

47.24?

Bakery

47.21?

F&V

47.23?

Fish

47.22?

Butchery

47.2?

Supermarket

Yes

No

Convenience store

Yes

No

Unspecialized food store

Any 47.1 or 47.2 CNAE code

47.1?

47.2?
Exposure Measures

Food

To understand cross-national differences in the local food environment between Madrid and Baltimore by comparing an average neighborhood in each city in terms of food store types, healthy food availability, and residents' pedestrian access.
a) Exploratory Study in a Median Area of Madrid

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Exposure Measures

Physical Activity

DOI 10.1186/s12942-017-0095-7

International Journal of Health Geographics

RESEARCH

Open Access

Intersection of neighborhood dynamics and socioeconomic status in small-area walkability: the Heart Healthy Hoods project

Pedro Gullón¹,²⁺, Usama Bilal¹,³⁺, Alba Cebrecos¹,⁴, Hannah M. Badland⁵, Iñaki Galán⁶ and Manuel Franco¹,³*  

Aim

To study the association between area-level SES and walkability in the city of Madrid (Spain) evaluating the potential effect modification of neighborhood dynamics.
### Method:

#### Table 1 Area Socioeconomic status, Walkability and neighborhood dynamics indicators

<table>
<thead>
<tr>
<th>Construct</th>
<th>Domain</th>
<th>Indicator</th>
<th>Operationalization</th>
<th>Source</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SES</td>
<td>Education</td>
<td>Low Education</td>
<td>Residents with mandatory studies or below/all residents aged 25 or above</td>
<td>Padrón</td>
<td>Census section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Education</td>
<td>Residents with university education or above/all residents aged 25 or above</td>
<td>Padrón</td>
<td>Census section</td>
</tr>
<tr>
<td>Occupation</td>
<td>Part time Jobs</td>
<td>Part time workers/all workers</td>
<td></td>
<td>Social security</td>
<td>Neighborhood</td>
</tr>
<tr>
<td></td>
<td>Temporal Jobs</td>
<td>Workers in temporal jobs/all workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manual Occupation Class</td>
<td>Workers in manual or unskilled occupations/all workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wealth</td>
<td>Housing Prices</td>
<td>Average sale price of housing per m²</td>
<td></td>
<td>Idealista report</td>
<td>Census section</td>
</tr>
<tr>
<td></td>
<td>Unemployment Rate</td>
<td>Residents registered as unemployed/all residents aged 16–64</td>
<td></td>
<td>Employment service</td>
<td>Neighborhood</td>
</tr>
<tr>
<td>Walkability</td>
<td>Density</td>
<td>Residential Density</td>
<td>Occupied Dwellings/km²</td>
<td>Housing census</td>
<td>Census section</td>
</tr>
<tr>
<td></td>
<td>Population Density</td>
<td>Residents/km²</td>
<td></td>
<td>Padrón</td>
<td>Census section</td>
</tr>
<tr>
<td></td>
<td>Retail Destinations</td>
<td>Retail and Service Destinations/km²</td>
<td></td>
<td>Retail spaces census</td>
<td>Census section</td>
</tr>
<tr>
<td>Street Structure</td>
<td>Street Connectivity</td>
<td>Kernel Density in 3 m x 3m pixels of the density of street intersections</td>
<td></td>
<td>CARTOCUIDAD</td>
<td>Census section</td>
</tr>
<tr>
<td>Neighborhood dynamics</td>
<td>Gentrification</td>
<td>Increase in Education level</td>
<td>Rank difference in high education from 2005 to 2014 (&gt;p95)</td>
<td>Padrón</td>
<td>Census section</td>
</tr>
<tr>
<td></td>
<td>Neighborhood age</td>
<td>Year of construction</td>
<td>Median year of construction (categorized)</td>
<td>Catastro</td>
<td>Census section</td>
</tr>
</tbody>
</table>
Exposure Measures

Physical Activity
Results:

- Area-level SES and walkability were inversely and significantly associated.
- This pattern did not hold for areas with an increase in education level.
- The association was attenuated in newly built areas.
Aim

To test if the Madrid Systematic Pedestrian and Cycling Environment Scan (M-SPACES) discriminates between areas with different urban forms and to validate virtual street auditing using M-SPACES.
HHH Methods and Results

a) **Exploratory Study in a Median Area of Madrid**

b) **Urban Environment Exposure Measures**
   1. Food
   2. Physical Activity
   3. **Tobacco**
   4. Alcohol

c) **Results by working groups**
   1. Urban Geography
   2. Qualitative Research
Exposure Measures

Tobacco

A GIS-Based analysis to evaluate the spatial distribution of tobacconist: the case study of Madrid, Spain

R. Valiente; X. Sureda; U. Bilal; M. Franco; Ana Navas-Acién; J. Pearce; F. Escobar
(work in progress)

Aim

To study the distribution of tobacco stores and the extent in which they comply the tobacco market regulations in Madrid.
Median distance between tobacco stores and schools: 208,68 m
Minimum distance between tobacco stores and schools: 19,28 m

N tobacco stores: 638
HHH Methods and Results

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Aim

To describe the development and test–retest reliability of OHCITIES, an instrument characterizing alcohol urban environment in terms of availability, promotion and signs of consumption.
### Exposure Measures

## Alcohol

### OHCITIES DESIGN

#### MAINDOMAINS

<table>
<thead>
<tr>
<th>Availability and accessibility</th>
<th>On-premises</th>
<th>Off-premises</th>
<th>Public spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of outlet</td>
<td>Signs of hours of sales</td>
<td>Signs of prohibition of alcohol sales to minors</td>
<td>Signs of prohibition of alcohol sales after 10pm</td>
</tr>
<tr>
<td>Presence of street vendors</td>
<td>Furniture and structural elements: labels and/or awnings, alcohol drink menus, alcohol boxes or barrels left by suppliers, showcases, barrels used as tables, wall menu support, blackboard, alcohol sales area visible from outside</td>
<td>Items on the terraces or similar: canvas, tables, chairs, umbrellas, napkins, holders, ashtrays</td>
<td>Presence and number of alcohol advertisements associated to the outlet</td>
</tr>
<tr>
<td>Promotion</td>
<td>Promotion on any support (advertisement or sponsorship)</td>
<td>Presence of people promoting alcohol (i.e. promoters offering alcohol discounts)</td>
<td>Presence and number of: people drinking, bottles or similar, and glasses or similar</td>
</tr>
</tbody>
</table>

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[http://hhhproject.eu](http://hhhproject.eu)
Exposure Measures

Alcohol

A. Availability of alcohol products in a convience store, 2015, Madrid

B. Signs of alcohol consumption in a public square, 2015, Madrid

C. Promotion of alcohol products in a spanish restaurant chain, 2015, Madrid

Photographs: Victor G. Carreño
Results

➢ Percent-agreement in on-premise and off-premise alcohol outlets greater than 80%

➢ Inter-rater and test–retest reliability were generally above 0.80

➢ 26 streets and 3 public squares with signs of alcohol consumption
a) Exploratory Study in a Median Area of Madrid

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Aim

To design and implement a multicomponent method to characterize and evaluate environmental correlates of obesity: the food and the physical activity urban environments.
A multicompontent proposal to assess cardiovascular healthy environments:

Heart Healthy Hoods Index

Cebrecos A., Escobar F., Klein O., Díez J., Gullón P., Sureda X., Borrel L., and Franco M.

(work in progress)

Aim

Implementing and improving a multicompontent method to characterize the built environment related with the four main behavioral risk factors of cardiovascular health studied in the HHH project: diet, physical activity, tobacco and alcohol.
HHH WPS
EHR: 1,446,994
2014
45-70 yrs

14 indicators
- Socioeconomic
- Demographics

PCA
- Manual workers
- Unemployment
- Eventual employees
- Insufficient instruction

CVD Prevalence
Deprivation

http://hhhproject.eu
Results

➢ Statistically → Model B

➢ Areas ↑ CVD and ↓ Environment → \( r = -0.69** \)
  - CVD and deprivation \( r=0.09* \)
  - Model and deprivation \( r=0.19** \)

➢ Areas ↑ CVD and ↑ Environment → \( r = 0.65** \)
  - CVD and deprivation \( r=0.46** \)
  - Model and deprivation \( r=0.47** \)

** 0.01 *0.05

http://hhhproject.eu
HHH Methods and Results

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Neighborhoods under change and residents’ health perceptions: The Heart Healthy Hoods qualitative study (bmc public health)

Conde P, Gutiérrez M, Sandín M, Díez J, Rivera J, Franco M.
(under review)

Aim

To describe the social and neighborhood changes occurring in a middle low socioeconomic area of Madrid according to their residents.

To explore how these neighborhood changes are connected to residents’ health perceptions.
Methods

Exploratory qualitative study within 12 months (from January 2014 to January 2015) using 16 semi-structured interviews. Residents + professionals.

Interview topic guide

➢ Neighborhood description
➢ Uses of the neighborhood
➢ Health related to neighborhood
Breakdown of traditional forms vs Individualism

Rapid rhythms of life
(-) Lack of time
Change in gender/age role

Generation and cultural fracture

Economic crisis
Impoverishment and lack of resources
High working hours

Loss of trust relationships
(-) Loneliness and lack of social support

New diet practices
(-) Not very healthy diets

New uses of public spaces
(-) Loss of public space use

Associative networks support
(+ Strengthen self-esteem
(+ Decreases anxiety
(+ Increases social cohesion

Participation of elderly in health promotion and education programs
(+ Promotes Active ageing

Unemployment and job insecurity
(-) Unhealthy diets
(-) Stress, Anxiety
(+ Intergenerational solidarity
HHH Ancillary Studies

1. HHH Retrospective Study 2015-2016
2. Smoking in the City 2016-2019
3. Urban environment and health: Qualitative approach in the Heart Healthy Hoods Study 2017-2020
4. Physical and social tobacco environment in neighborhoods in Madrid city 2017-2020
5. Photovoice Villaverde 2015
Photovoice Villaverde
(click for the video)
Acknowledgements

• Participants
• Whole HHH Madrid team and collaborations
• Different funding agencies:
  • European Research Council
  • Council and Region of Madrid
  • Health Research Fund
  • National Research Plan
  • National Drug Plan
  • Mapfre Foundation
  • Center for a Livable Future, Johns Hopkins
Merci pour votre attention

Thanks for your attention

Gracias por su atención