# Neighborhood medical facilities and sudden cardiac arrest and survival

Draft abstract and tables from Charlene Goh

**Background**

The neighborhood environment has been proposed to predict cardiovascular disease, although the exact neighborhood attribute that confers this advantage is unknown. We test the hypothesis that having more medical facilities in the neighborhood may represent better opportunities for the medical management of chronic diseases and risk factors, increasing the physiological resilience to cardiac arrest and improved survival outcomes after a cardiac arrest.

**Methods:** The Cardiac Arrest Blood Study-Repository (CABS-R) is a registry of blood samples and abstracted emergency response records of sudden cardiac arrest cases and population-based controls from King County, WA. We linked residential addresses of subjects from CABS-R to nearby medical businesses using the National Establishment Time-Series (NETS) longitudinal database of registered businesses. Six types of medical facilities contributed to the total count of medical facilities (urgent care and hospital facilities; offices and clinics of health practitioners; residential facilities with health care; pharmacies; mental health care facilities; and dental care facilities). We performed analyses of total medical facilities and of the separate six types of medical facilities within a 5km buffer and within the census tract of the home address: 1) in relation to case status for 730 cases and 764 controls, 2) in relation to survival after cardiac arrest for 1811 cases presenting with ventricular fibrillation.

**Results:** Increased density of medical facilities was associated with cardiac arrest (OR: 1.61, 95% CI: 1.43, 1.81; per z-score increase). This association was observed in all types of medical facilities, including those not hypothesized to be cardiovascular health promoting. On the other hand, medical facilities were unassociated with survival after ventricular fibrillation cardiac arrest (OR: 1.05, 95% CI: 0.94, 1.16; per z-score increase in medical facilities).

**Conclusion:**

We did not find support for the hypothesized salutary effect of neighborhood medical infrastructure on case status or survival after cardiac arrest.

**Note: Excluding those who had SCA at nursing home or had missing neighborhood data**

**Table 1. Neighborhood Characteristics of CABS-R subjects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Controls  (n= 764) | Comparable Cases  (n=730) | VF Cases who died  (n=1306) | VF Cases who survived  (n=505) |
|  |  |  |  |  |
| *Home Census Tract* |  |  |  |  |
| Per-capita Income, $ | 33,005 | 30,386 | 30,755 | 29,806 |
| Medical Facilities (median) | 5 | 7 | 6 | 7 |
| Urgent care | 0 | 0 | 0 | 0 |
| Health practitioners | 2 | 3 | 3 | 3 |
| Residential Homes | 0 | 1 | 0 | 1 |
| Pharmacies | 0 | 0 | 0 | 0 |
| Mental Health | 0 | 1 | 0 | 0 |
| Dentists | 1 | 1 | 1 | 1 |
| *5 km buffer from Home Census Tract Centroid* |  |  |  |  |
| Medical facilities | 125 | 181 | 184 | 175 |
| Urgent care | 2 | 3 | 3 | 3 |
| Health practitioners | 59 | 89 | 91 | 85 |
| Residential Homes | 9.5 | 16 | 15 | 17 |
| Pharmacies | 11 | 15 | 15 | 13 |
| Mental Health | 10 | 16 | 16 | 15 |
| Dentists | 32 | 43 | 44 | 42 |

Age 80 or younger, with no history of clinically diagnosed heart disease, cardiac arrest incident at or prior to 2006

**Table 2. Characteristics of High versus Low Medical facilities (median split) neighborhoods for the comparable cases (n= 1494)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | High  (5km buffer) | Low  (5km buffer) | High  (census tract) | Low  (census tract) |
| Per capita income of census tract, $ | 33,362 | 30,125 | 32,528 | 30,918 |
| Population density per mile | 7187 | 3882 | 6566 | 4452 |
| Residential housing per mile | 3648 | 1583 | 3296 | 1902 |
| Financial institutions | 52 | 13 | 41 | 23 |
| Land value per lot sq footage, $ | 46 | 20 | 42 | 22 |
| Mean medic response interval (mins) | 16 | 22 | 16 | 22 |
| Survived to hospital discharge % | 32 | 31 | 35 | 27 |

**Table 3. Home neighborhood environments as related to case status, stratified by SES for 764 controls and 730 ‘comparable’ cases (n=1494). All analyses z-transform count of institutions and control for age, year of event and gender.**

|  |  |  |  |
| --- | --- | --- | --- |
| Exposure | Odds Ratio per z-score  increase in exposure | 95% Confidence Interval | |
| *Home 5km Buffer* |  |  |  |
| Medical facilities | **1.61** | **1.43** | **1.81** |
| Lowest income quartile | 2.19 | 1.49 | 3.22 |
| Highest income quartile | 1.29 | 1.07 | 1.56 |
| Urgent care | **1.68** | **1.47** | **1.92** |
| Lowest income quartile | 2.18 | 1,52 | 3.13 |
| Highest income quartile | 1.31 | 1.08 | 1.58 |
| Health practitioners | **1.59** | **1.41** | **1.79** |
| Lowest income quartile | 2.32 | 1.55 | 3.48 |
| Highest income quartile | 1.29 | 1.07 | 1.55 |
| Residential Homes | **1.60** | **1.42** | **1.81** |
| Lowest income quartile | 1.62 | 1.23 | 2.14 |
| Highest income quartile | 1.29 | 1.02 | 1.62 |
| Pharmacies | **1.71** | **1.52** | **1.93** |
| Lowest income quartile | 2.35 | 1.64 | 3.37 |
| Highest income quartile | 1.27 | 1.05 | 1.53 |
| Mental Health | **1.61** | **1.42** | **1.83** |
| Lowest income quartile | 2.15 | 1.40 | 3.29 |
| Highest income quartile | 1.35 | 1.13 | 1.63 |
| Dentists | **1.49** | **1.33** | **1.66** |
| Lowest income quartile | 1.65 | 1.18 | 2.31 |
| Highest income quartile | 1.22 | 1.00 | 1.49 |
| Financial institutions | **1.73** | **1.52** | **1.96** |
| Lowest income quartile | 2.61 | 1.74 | 3.90 |
| Highest income quartile | 1.29 | 1.08 | 1.55 |
|  |  |  |  |
| *Census tract* |  |  |  |
| Medical facilities | **1.18** | **1.06** | **1.32** |
| Lowest income quartile | 1.20 | 0.87 | 1.66 |
| Highest income quartile | 1.07 | 0.93 | 1.24 |
| Urgent care | **1.20** | **1.06** | **1.37** |
| Lowest income quartile | 1.44 | 1.10 | 1.89 |
| Highest income quartile | 1.04 | 0.81 | 1.35 |
| Health practitioners | **1.17** | **1.05** | **1.31** |
| Lowest income quartile | 1.46 | 0.99 | 2.16 |
| Highest income quartile | 1.04 | 0.90 | 1.21 |
| Residential Homes | **1.13** | **1.01** | **1.28** |
| Lowest income quartile | 1.01 | 0.79 | 1.29 |
| Highest income quartile | 1.24 | 0.90 | 1.71 |
| Pharmacies | **1.20** | **1.07** | **1.35** |
| Lowest income quartile | 1.23 | 0.92 | 1.63 |
| Highest income quartile | 1.13 | 0.96 | 1.33 |
| Mental Health | **1.15** | **1.03** | **1.27** |
| Lowest income quartile | 0.90 | 0.59 | 1.38 |
| Highest income quartile | 1.08 | 0.95 | 1.22 |
| Dentists | **1.06** | **0.95** | **1.18** |
| Lowest income quartile | 0.98 | 0.80 | 1.20 |
| Highest income quartile | 1.09 | 0.90 | 1.33 |
| Financial institutions | **1.35** | **1.15** | **1.58** |
| Lowest income quartile | 1.55 | 0.97 | 2.50 |
| Highest income quartile | 1.22 | 1.03 | 1.45 |

**Table 4. Home neighborhood environments as related to survival after cardiac arrest, stratified by SES for 1811 cases presenting with ventricular fibrillation. All analyses z-transform count of institutions and control for age, year of event and gender.**

|  |  |  |  |
| --- | --- | --- | --- |
| Exposure | Odds Ratio per z-score  increase in exposure | 95% Confidence Interval | |
| *Home 5km Buffer* |  |  |  |
| Medical facilities | **1.05** | **0.94** | **1.16** |
| Lowest income quartile | 1.17 | 0.91 | 1.51 |
| Highest income quartile | 1.02 | 0.84 | 1.24 |
| Urgent care | **1.03** | **0.93** | **1.15** |
| Lowest income quartile | 1.17 | 0.95 | 1.45 |
| Highest income quartile | 1.01 | 0.83 | 1.22 |
| Health practitioners | **1.04** | **0.93** | **1.15** |
| Lowest income quartile | 1.18 | 0.91 | 1.54 |
| Highest income quartile | 1.02 | 0.84 | 1.23 |
| Residential Homes | **1.08** | **0.96** | **1.21** |
| Lowest income quartile | 1.05 | 0.84 | 1.32 |
| Highest income quartile | 1.10 | 0.86 | 1.40 |
| Pharmacies | **1.03** | **0.92** | **1.15** |
| Lowest income quartile | 1.17 | 0.91 | 1.51 |
| Highest income quartile | 0.98 | 0.81 | 1.19 |
| Mental Health | **1.04** | **0.94** | **1.16** |
| Lowest income quartile | 1.16 | 0.91 | 1.47 |
| Highest income quartile | 1.02 | 0.85 | 1.23 |
| Dentists | **1.06** | **0.95** | **1.18** |
| Lowest income quartile | 1.13 | 0.86 | 1.49 |
| Highest income quartile | 1.02 | 0.83 | 1.27 |
| Financial institutions | **1.07** | **0.96** | **1.19** |
| Lowest income quartile | 1.17 | 0.92 | 1.49 |
| Highest income quartile | 1.05 | 0.87 | 1.27 |
|  |  |  |  |
| *Census tract* |  |  |  |
| Medical facilities | **0.94** | **0.84** | **1.04** |
| Lowest income quartile | 0.82 | 0.62 | 1.08 |
| Highest income quartile | 0.96 | 0.80 | 1.16 |
| Urgent care | **0.96** | **0.86** | **1.07** |
| Lowest income quartile | 0.94 | 0.79 | 1.12 |
| Highest income quartile | 0.91 | 0.69 | 1.20 |
| Health practitioners | **0.95** | **0.86** | **1.06** |
| Lowest income quartile | 0.80 | 0.59 | 1.09 |
| Highest income quartile | 0.97 | 0.80 | 1.17 |
| Residential Homes | **1.02** | **0.92** | **1.14** |
| Lowest income quartile | 1.17 | 0.94 | 1.46 |
| Highest income quartile | 0.97 | 0.73 | 1.31 |
| Pharmacies | **0.97** | **0.87** | **1.08** |
| Lowest income quartile | 0.98 | 0.74 | 1.30 |
| Highest income quartile | 0.97 | 0.81 | 1.17 |
| Mental Health | **0.95** | **0.85** | **1.06** |
| Lowest income quartile | 0.73 | 0.50 | 1.08 |
| Highest income quartile | 0.97 | 0.83 | 1.13 |
| Dentists | **0.90** | **0.81** | **1.01** |
| Lowest income quartile | 0.83 | 0.67 | 1.04 |
| Highest income quartile | 0.96 | 0.77 | 1.19 |
| Financial institutions | **0.93** | **0.82** | **1.05** |
| Lowest income quartile | 0.44 | 0.25 | 0.78 |
| Highest income quartile | 0.98 | 0.85 | 1.13 |