

Effects of an air pollution personal alert system on health service usage in a high-risk general population: a quasi experimental study using linked data

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Introduction

Multi-disciplinary, multi-agency team carried out an evaluation of the airAware system

Study Question:

“Does *informing susceptible individuals* of episodes of poor air quality **enable** them to *better manage their health condition* and result in reduced contact with the health care system?”

Introduction

- Mixed methods evaluation;
- System Performance
 - uptake
 - accuracy (sensitivity/specificity)
- Public Health Outcomes
 - behaviour } Qualitative assessment
 - perceptions } Qualitative assessment
 - NHS utilisation } Quantitative assessment

Study Cohort

- 4 GP practices participated
- 1,395 patients invited
- with Asthma, COPD or CHD
- 180 people signed up (the treatment group)
- 1215 declined invitation (the control group)

Statistical Analysis

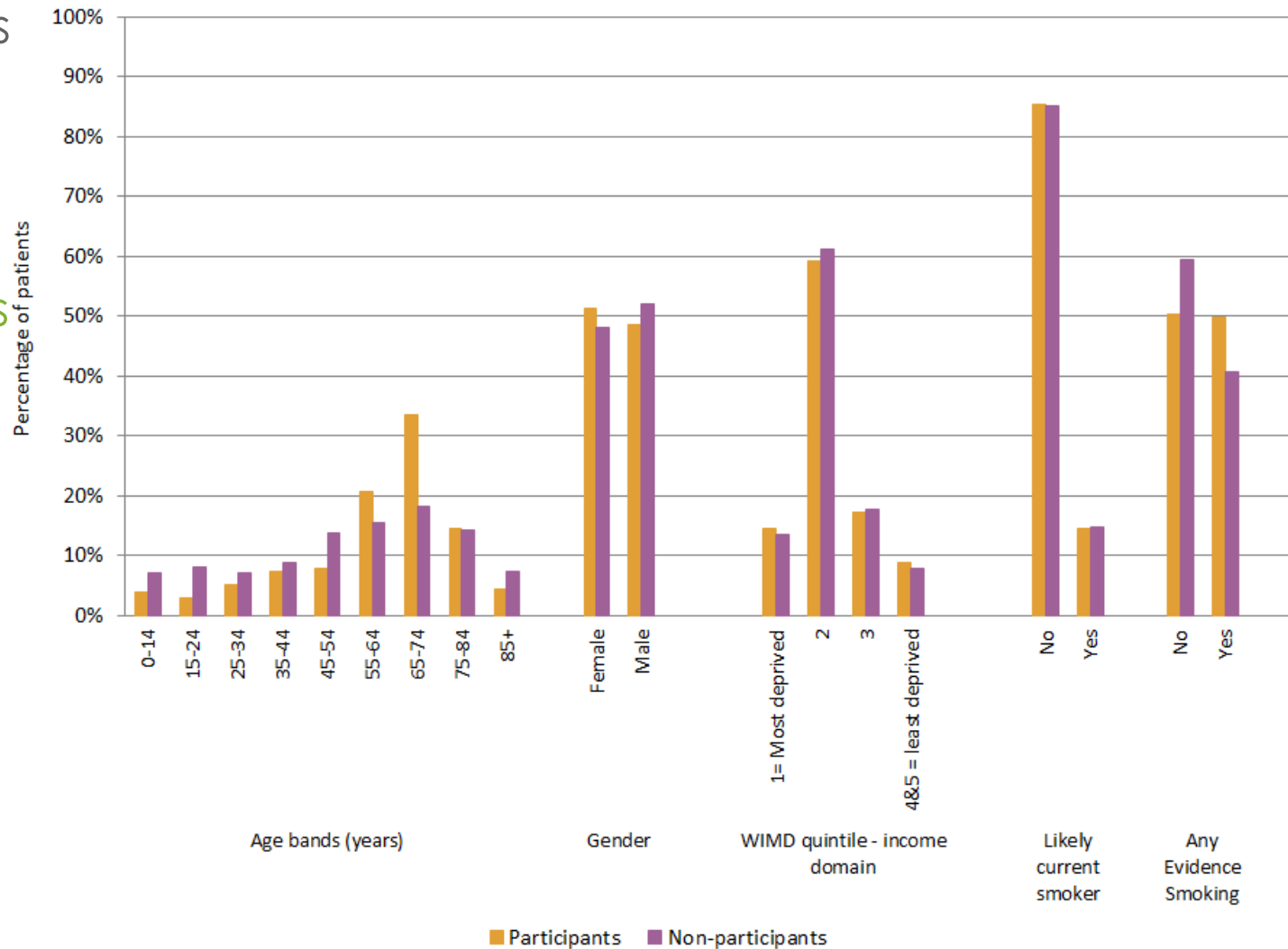
- negative–binomial *regression* models
- controlled, before-after analysis
- compare health service *before* and *after* signing up
- **assess change** in treatment group with change in control group

Data

- **SAIL** databank
- Health records obtained retrospectively
 - GP records
 - Hospital admissions
 - Emergency department attendances
 - outpatient visits
 - prescriptions
- 2 year baseline data (before sign up date)
- Followed up to 2 years (after sign up date)
- Pseudo start dates for the control group matched to treatment group

Cohort profile

- participants generally older
- slightly higher odds of smoking (not statistically significant)
- otherwise similar



Baseline comparison I vs C

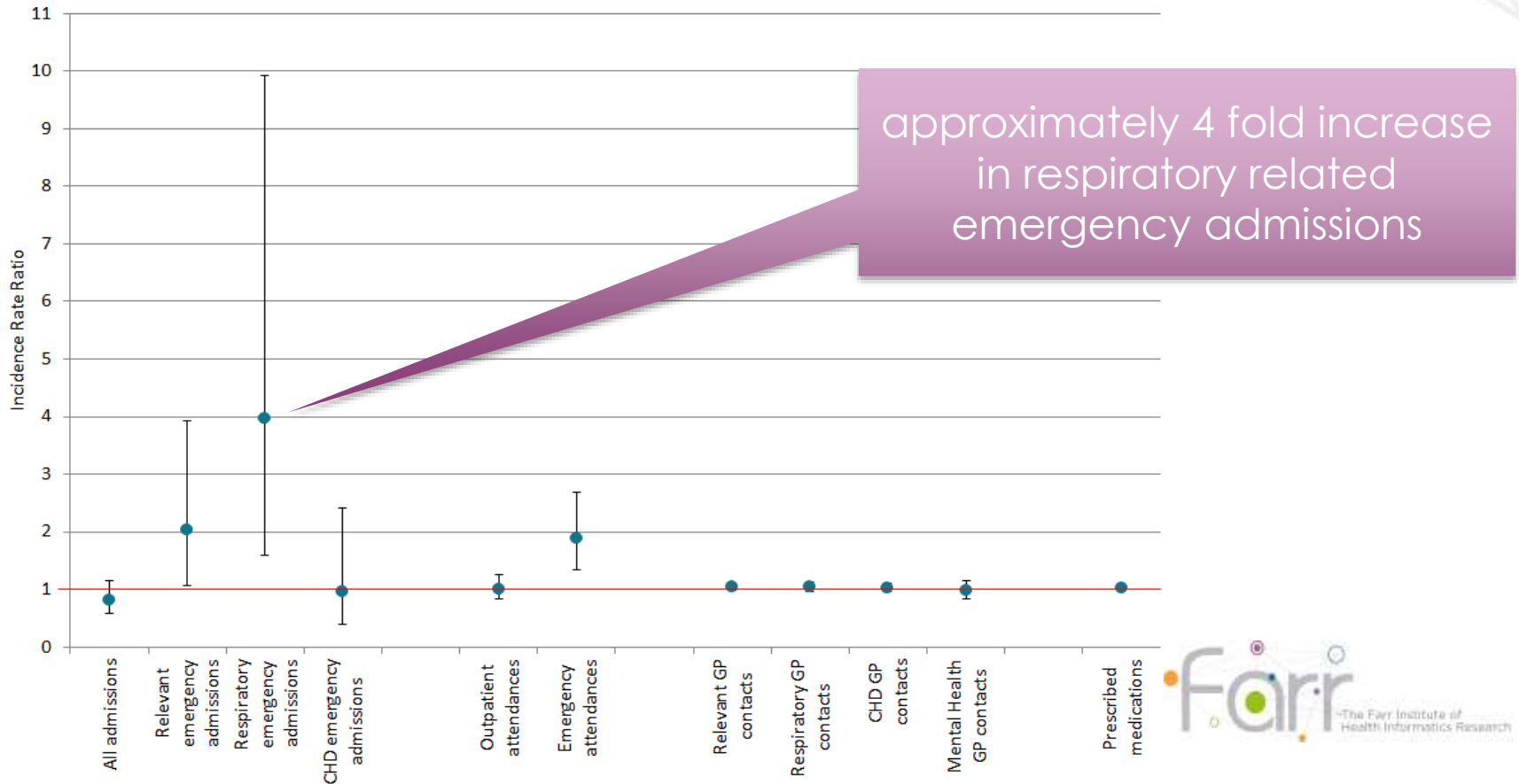
- Total of 1939 GP contacts before service started,
- Rate of approximately 11 GP contacts per person per year

Outcome measure	Participants		Non-Participants	
	before	after	before	after
GP relevant contacts	1939 (10.85)	3854 (12.21)	12504 (10.42)	23153 (11.08)
GP respiratory contacts	1149 (6.43)	2233 (7.08)	6215 (5.18)	11614 (5.56)
GP CHD contacts	1300 (7.27)	2623 (8.31)	8268 (6.89)	15520 (7.43)
GP MH contacts	498 (2.79)	961 (3.05)	3942 (3.28)	7405 (3.54)
Prescribed Medications	11016 (61.63)	21752 (68.93)	76622 (63.83)	146631 (70.19)
All admissions	156 (0.44)	99 (0.26)	1256 (0.52)	983 (0.38)
Relevant emergency admissions	18 (0.05)	46 (0.12)	239 (0.10)	294 (0.11)
Respiratory emergency admissions	8 (0.02)	39 (0.10)	125 (0.05)	182 (0.07)
CHD emergency admissions	11 (0.03)	13 (0.03)	136 (0.06)	161 (0.06)
Outpatient attendances	797 (2.23)	500 (1.31)	6170 (2.57)	3897 (1.50)
Emergency attendances	98 (0.27)	201 (0.52)	1056 (0.44)	1328 (0.51)

- Total of 18 relevant emergency admissions before service started,
- Rate of 0.05 per person year or 5% risk of one admission per person per year

Intervention Effect

- Change over time among participants compared to controls
- Adjusted for covariates; age, sex, deprivation and smoking status



Discussion

- Demonstrates value of **linked health and environmental data** in real world evaluation
- Results of health service utilisation are **opposite** to that predicted from intention behind COMEAP advice
- Generalisation: opportunities for benefit and harm will **vary by air pollution exposure** profiles
- Results **do not support** continuation or expansion of the system



Thank You

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secondary care models

Adjusted Incidence Rate Ratios (and 95% confidence limits)

Model Coefficients	Any admission	Relevant emergency admission	Respiratory emergency admission	CHD emergency admission	Outpatient attendance	Emergency attendance
Before	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
After	0.78 (0.70, 0.88)	1.07 (0.88, 1.31)	1.19 (0.91, 1.56)	1.13 (0.87, 1.47)	0.59 (0.55, 0.64)	1.20 (1.08, 1.34)
Non-participants	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Participants	0.93 (0.71, 1.21)	0.50 (0.28, 0.90)	0.40 (0.16, 0.97)	0.52 (0.25, 1.06)	0.91 (0.73, 1.13)	0.52 (0.38, 0.71)
<65 years	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
65-84 years	2.08 (1.77, 2.46)	2.64 (2.02, 3.45)	1.66 (1.13, 2.45)	5.61 (3.84, 8.18)	2.08 (1.79, 2.41)	1.13 (0.97, 1.31)
85+ years	2.87 (2.19, 3.77)	4.75 (3.17, 7.11)	2.42 (1.27, 4.59)	11.49 (6.92, 19.07)	2.08 (1.61, 2.70)	1.88 (1.47, 2.39)
Females	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Males	0.93 (0.80, 1.09)	1.06 (0.83, 1.37)	0.77 (0.53, 1.10)	1.69 (1.21, 2.36)	0.94 (0.82, 1.08)	1.06 (0.92, 1.21)
Most deprived	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
2nd most deprived	0.92 (0.73, 1.15)	0.85 (0.59, 1.23)	0.66 (0.39, 1.12)	1.22 (0.74, 2.01)	0.87 (0.72, 1.06)	0.97 (0.80, 1.19)
3rd most deprived	0.92 (0.70, 1.21)	1.13 (0.73, 1.74)	1.08 (0.59, 1.99)	1.61 (0.89, 2.90)	0.83 (0.65, 1.05)	1.08 (0.85, 1.36)
Least Deprived	0.86 (0.61, 1.22)	1.08 (0.63, 1.84)	0.98 (0.45, 2.11)	1.54 (0.76, 3.13)	0.93 (0.69, 1.25)	0.99 (0.73, 1.34)
Not current smoker	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Current smoker	1.05 (0.82, 1.35)	1.31 (0.88, 1.95)	1.87 (1.06, 3.31)	0.89 (0.52, 1.54)	1.01 (0.81, 1.26)	1.13 (0.91, 1.42)
No smoking history	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Any smoking history	1.22 (1.03, 1.46)	1.13 (0.85, 1.51)	1.01 (0.65, 1.56)	1.31 (0.92, 1.87)	1.21 (1.03, 1.42)	1.01 (0.86, 1.18)
No intervention	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Intervention	0.82 (0.58, 1.14)	2.04 (1.06, 3.93)	3.97 (1.59, 9.93)	0.97 (0.39, 2.42)	1.01 (0.83, 1.25)	1.89 (1.34, 2.68)

primary care models

Adjusted Incidence Rate Ratios (and 95% confidence limits)

Model Coefficients	Relevant GP contacts	Respiratory GP contacts	CHD GP contacts	Mental Health GP contacts	Prescribed medications
Before	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
After	1.08 (1.05, 1.11)	1.08 (1.04, 1.11)	1.11 (1.08, 1.15)	1.13 (1.06, 1.20)	1.10 (1.08, 1.13)
Non-participants	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Participants	1.04 (0.92, 1.17)	1.27 (1.01, 1.59)	1.19 (0.85, 1.66)	1.39 (0.81, 2.37)	1.15 (0.99, 1.32)
<65 years	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
65-84 years	1.72 (1.58, 1.87)	0.87 (0.74, 1.03)	4.42 (3.44, 5.69)	1.24 (0.84, 1.84)	2.35 (2.12, 2.60)
85+ years	2.02 (1.73, 2.36)	0.54 (0.40, 0.73)	5.53 (3.65, 8.38)	2.65 (1.40, 5.05)	2.20 (1.83, 2.64)
Females	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Males	1.06 (0.98, 1.14)	0.85 (0.73, 0.99)	1.32 (1.05, 1.66)	0.44 (0.31, 0.63)	0.94 (0.86, 1.03)
Most deprived	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
2nd most deprived	0.99 (0.88, 1.11)	0.98 (0.79, 1.22)	1.04 (0.74, 1.45)	0.93 (0.54, 1.59)	0.98 (0.85, 1.12)
3rd most deprived	1.07 (0.93, 1.23)	1.23 (0.95, 1.61)	0.84 (0.56, 1.24)	0.59 (0.31, 1.14)	0.89 (0.76, 1.05)
Least Deprived	0.86 (0.73, 1.03)	0.84 (0.61, 1.17)	0.61 (0.37, 1.02)	0.55 (0.24, 1.21)	0.78 (0.63, 0.96)
Not current smoker	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Current smoker	1.03 (0.90, 1.17)	1.14 (0.89, 1.45)	0.91 (0.64, 1.31)	1.85 (1.08, 3.16)	0.99 (0.85, 1.15)
No smoking history	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Any smoking history	1.36 (1.24, 1.49)	1.29 (1.08, 1.55)	2.25 (1.73, 2.93)	1.49 (0.99, 2.24)	1.82 (1.63, 2.03)
No intervention	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Intervention	1.04 (0.98, 1.11)	1.04 (0.96, 1.13)	1.02 (0.95, 1.11)	0.98 (0.84, 1.16)	1.03 (0.98, 1.09)



Questions?