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The Airwave Health Monitoring Study of police officers and staff in Great Britain: Rationale, design and methods

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ABSTRACT

Background: The Airwave Health Monitoring Study was established to evaluate possible health risks associated with use of TETRA, a digital communication system used by police forces and other emergency services in Great Britain since 2001. The study has been broadened to investigate more generally the health of the work force.
Methods: From 2004, participants from each force who agreed to participate were enrolled either with an enrolment questionnaire or a comprehensive health screening performed locally. This includes questionnaire, 7-day food diaries, anthropometry, measurements of cardiovascular and cognitive function, blood chemistry, coagulation and haematology. Blood and urine samples are stored in vapour phase liquid nitrogen allowing long-term access for biochemical or genetic analysis. Access to the resource is via an access committee and a steering committee, including external scientific advisers as well as representatives of the police officers and staff.
Results: By the end of 2012, the study had recruited 42,112 participants, of whom 35,199 (83.6%) had attended the health screening. Almost two thirds of participants were men and 71% of them were a TETRA user. Being in lower ranks (constable/sergeant and staff) was associated with a worse cardio-metabolic risk profile compared to higher ranks (inspector or chief inspector, superintendent and above).
Conclusion: The Airwave Health Monitoring Study is the only large-scale cohort study of police employees worldwide. The specificities of this sample, such as its well-defined job hierarchy, make it a particularly valuable occupational cohort. Participants have consented to the use of their data and samples for future, currently unspecified, research purposes.

1. Introduction

Terrestrial Trunked Radio (TETRA) is a digital communication system adopted progressively by police forces and other emergency services in Great Britain since 2001. It uses a TETRA-based national network provided by Airwave Solutions Limited. TETRA differs from GSM (Global System for Mobile Communication) mobile phone technology in two important respects. First, the average output power of TETRA hand portables can, in some circumstances, exceed those from GSM900 and GSM1800 mobile phones. Second, TETRA transmission is pulsed at 17.6 Hz (1/56.7 ms) whereas mobile phones transmission is pulsed at 217 Hz (1/4.6 ms).

In 2000, the Independent Expert Group on Mobile Phones (Stewart Report) suggested that exposure to signal modulation at or around 16 Hz might have adverse effects on health (Independent Expert Group on Mobile Phones (IEGMP), 2000) based on experimental findings of increased calcium efflux from brain tissue (Bawin et al., 1975). While brief exposure to TETRA signals did not affect cognitive function or subjective symptoms in two double-blind randomised trials (Nieto-Hernandez et al., 2011; Riddervold et al., 2010), no human epidemiological or occupational study had yet explored the possible long-term health risks associated with TETRA use.

In response to recommendations of the Stewart Report, the Home Office iScotland commissioned Imperial College London in 2003 to investigate the feasibility of setting up a cohort study of the British police forces. This study would aim to evaluate possible health risks associated with the use of TETRA. A target sample size of at least 60,000 participants was set to give sufficient power to detect a wide range of health outcomes. To account for the period of latency between initial exposure and onset of disease, participants would be

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followed up for at least 15–20 years. The Airwave Health Monitoring Study was launched in June 2004 with a pilot study in two forces, completed in 2006, before being rolled out nationally on a force by force basis. During the pilot, it was found that addition of a health screen boosted recruitment and gave an additional incentive for officers and staff to take part. The collection of extensive phenotypic data and the long-term storage of biological samples allow the investigation of research questions beyond the primary aim of the study. The Airwave Health Monitoring Study will therefore also investigate the health of the police force more generally.

2. Materials and methods

2.1. Inclusion procedure

The Airwave Health Monitoring Study is open to all 54 police forces in Great Britain, including police-related agencies that use Airwave and that are funded by the Home Office. In January 2012, a total of 259,283 people worked for police forces in Great Britain (155,892 police officers, 93,040 police staff, 7888 police community support officers and 2463 special constables) (Association of Chief Police Officers, 2012). The Airwave Health Monitoring Study aims to recruit over 60,000 participants by 2018. The study has ethical approval from the National Health Service Multi-site Research Ethics Committee (MREC/13/NW/0588).

Since the launch of the study in 2004, a total of 28 forces have so far agreed to participate. The study includes two phases. First, every employee receives the enrolment questionnaire via routine administration or the occupational health service. The second phase is a health screen performed locally by trained nurses using a standardised protocol (Fig. 1). Participants can attend the health screen irrespective of their participation in phase 1 and their Airwave usage. In phase 2, volunteers are recruited through general force-wide publicity (emails, wall posters, and articles in newsletters), word of mouth or direct contact if they request a health screen on their enrolment questionnaire. Police employees who do not belong to one of the forces enrolled, but who are in close geographical vicinity to an Airwave clinic may also attend. Employees are allowed in-work (abstraction) time to attend the health screen which usually takes around 40–50 min. Results of biological and clinical measurements from the health screen are mailed to the participants and, with consent, to their general practitioner (GP), usually within two months of their appointment. More rapid referral is done where indicated, e.g. for high blood pressure or abnormal electrocardiogram (ECG) requiring urgent medical attention.

The time between the enrolment and the health screening phase is determined by logistical constraints and varies between 6 months and one or more years. Participants sign a consent form permitting use of their data and samples for future research (specific consents are given for long-term blood and urine sample storage).

As of 31 December 2012, data on 42,897 individuals were included in the database. Among those, 322 individuals had an invalid consent (0.7%), most often because they forgot to sign the consent form at the end of the enrolment questionnaire (317 out of 322). To date, only 3 participants have withdrawn from the study during follow-up (0.007%). In addition, a number of individuals could not be linked to National Health Service (NHS) records. This occurred when either individuals provided insufficient detail to be traceable in the enrolment questionnaire ($n=394$, 1%) or when they could not be uniquely identified. For example, the NHS Information Centre Medical Research Information Service (MRIS) and the General Register Office for Scotland (GROS), cannot identify individuals who do not update their details after changing name and address ($n=66$, 0.1%). (Numbers of linked participants may increase as participants update their details with the NHS.) Therefore, 42,112 participants with linkage to NHS number were considered enrolled as of 31 December 2012 (98.2% of the total number of individual records, 196,541 person years; median follow-up=4.9 years).

Once participants are flagged by the NHS, we are able to follow them for morbidity and mortality events throughout the lifetime of the study unless they leave the United Kingdom ($n=24$, 0.06%), enrol in the armed forces ($n=28$, 0.07%) or are not registered with a GP ($n=71$, 0.17%).

Some 16% of participants completed only phase 1, 58% completed only phase 2 and 26% completed both (Fig. 2). Excluding the pilot study, the cohort enrols on average 50% of police forces' employees once both phases are complete

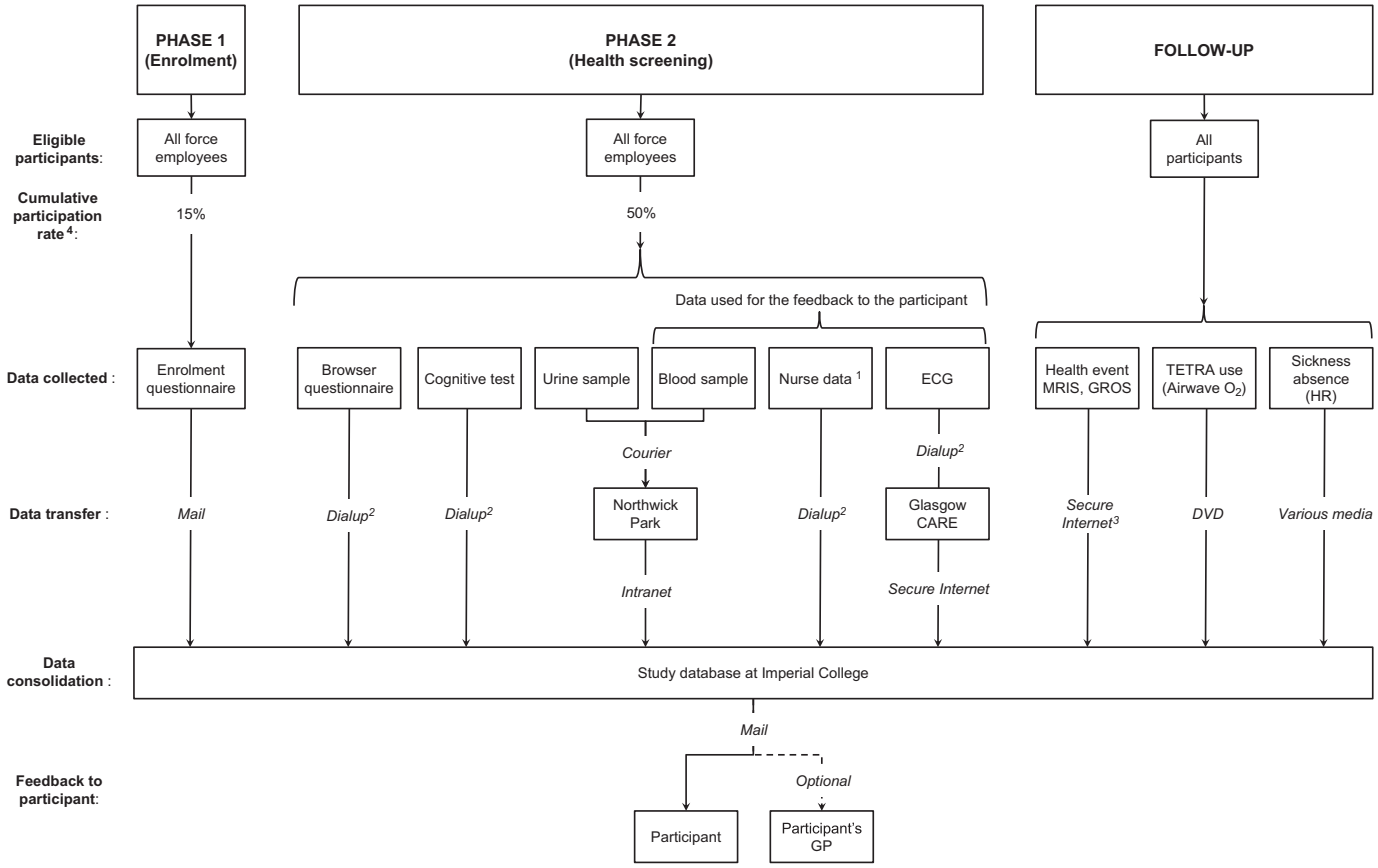

Fig. 1. Study design. [1]Nurse data include nurse interview and clinical measurements (blood pressure, anthropometric measurements, and arterial stiffness). [2]Internet access via telephone lines, [3]through MRIS/GROS website, and [4]excluding the 2 pilot forces. CARE: Computer Assisted Reporting of Electrocardiograms; ECG: electrocardiogram; GP: general practitioner; GROS: General Register Office for Scotland; HES: Hospital Episode Statistics; HR: Human Resource; MRIS: Medical Research Information Service; and TETRA: Terrestrial Trunked Radio.