**Introduction:** This paper reports on a new methodology to objectively study the world in which children live. The primary research study (Kids’Cam Food Marketing) illustrates the method; numerous ancillary studies include exploration of children’s exposure to alcohol, smoking, “blue” space and gambling, and their use of “green” space, transport, and sun protection.

**Methods:** One hundred sixty-eight randomly selected children (aged 11–13 years) recruited from 16 randomly selected schools in Wellington, New Zealand used wearable cameras and GPS units for 4 days, recording imagery every 7 seconds and longitude/latitude locations every 5 seconds. Data were collected from July 2014 to June 2015. Analysis commenced in 2015 and is ongoing. Bespoke software was used to manually code images for variables of interest including setting, marketing media, and product category to produce variables for statistical analysis. GPS data were extracted and cleaned in ArcGIS, version 10.3 for exposure spatial analysis.

**Results:** Approximately 1.4 million images and 2.2 million GPS coordinates were generated (most were usable) from many settings including the difficult to measure aspects of exposures in the home, at school, and during leisure time. The method is ethical, legal, and acceptable to children and the wider community.

**Conclusions:** This methodology enabled objective analysis of the world in which children live. The main arm examined the frequency and nature of children’s exposure to food and beverage marketing and provided data on difficult to measure settings. The methodology will likely generate robust evidence facilitating more effective policymaking to address numerous public health concerns.

According to the WHO Commission on Ending Childhood Obesity (ECHO), there is unequivocal evidence that unhealthy food marketing is related to childhood obesity. Reducing children’s exposure to, and the power of, marketing is one of ECHO’s key recommendations. Internationally, little is objectively known about children’s actual exposure to food marketing, other than via TV. It appears that no studies have quantified the presence of food marketing across multiple media in multiple settings. This research gap is largely due to the difficulty of collecting objective data.

The potential of wearable cameras for health research has been identified and demonstrated in physical activity, behavioral nutrition, and food marketing research. Wearable cameras collect data passively in real time, thus overcoming the recall bias and comprehension issues of survey research. As researchers are not required to be present during data collection, wearable cameras are less invasive and less time and resource intensive than traditional observation methods. Wearable cameras have the potential to provide more comprehensive access to participants’ behavior and environment than other observation methods, for example, access to homes. Social desirability bias is also limited, particularly if participants are blinded to the purpose of the study. Challenges of wearable camera and GPS unit research include difficulty in getting large sample sizes, reliance on the user for battery charging and powering on/off, device interference, poor-quality images in low-light situations, the time-consuming nature of data analysis, and ethical concerns. Further, research with preteens is limited to a feasibility study for Kids'Cam. This paper reports on the Kids'Cam methodology as a means to study the world in which children live.

METHODS

Study Design

Kids'Cam was a cross-sectional observational study of 168 Year 8 children (aged 11–13 years) in the Wellington region of New Zealand. This age group was considered to be the youngest that could use the technology and deal with the study demands. Participants wore an automated camera (Autographer, www.autographer.com, US$280) and GPS unit (Qstarz BT-Q1300ST Sports Recorder, US$120) on lanyards around their neck. The camera captured a 136-degree image of the scene ahead approximately every 7 seconds, and the GPS unit captured latitude and longitude every 5 seconds. Structured qualitative interviews were conducted with 33 participants to explore their engagement with food marketing, as part of the main study.

Ethical Approval

Ethical approval was obtained from the University of Otago Human Ethics Committee (Health) (13/220) to study any aspect of the world children live in and their interaction with it. Children were blinded to the primary food marketing focus of the study. Ensuring informed consent, protecting children from harm, and anonymity of participants and third parties are key ethical issues that will be discussed. Ethical issues about research with wearable cameras are discussed further in Barr et al., Barr and colleagues, and Kelly et al.

Pilot Study

A pilot study was conducted with ten children in one school, including focus groups with the children to explore their experience after the research was completed, and interviews with the lead teacher and principal. Of the few reported problems, most arose from the GPS unit being on a separate armband (therefore, the device was instead worn on a lanyard for the full study). All agreed that the experience was positive. Children commented “it was fun” and “I felt so professional.” Following the pilot, the study protocol and the children’s instruction manual were revised based on feedback from the children, teacher, and principal and using the researchers’ observations (available at diet.auckland.ac.nz/content/kidscam).

Quality Control

A study protocol was developed, piloted, and refined prior to the full study. Researchers were trained in the research procedures in a 1-day training session that included role play. Researchers collected data in pairs to cover the tasks required. Senior researchers (LS and MS) undertook initial data collection and then worked with others (MB, TC, GJ) until they were sufficiently skilled. A simple instruction manual for children was developed, piloted, and refined. Cameras and GPS units were checked for functionality after use. Calibrated scales (HD-316 Wedderburn Scales, Tanita Corporation, Tokyo, Japan) and a laser height measure (Precaster CA770 electronic laser measure) were used to calculate BMI.

Sampling and Recruitment

Sampling and recruitment were conducted in two stages, at school and then student level. All 93 schools in the Wellington region with Year 8 students were eligible for selection. Sampling of schools was stratified by school decile (socioeconomic measure) and student ethnicity (Māori, Pacific, and New Zealand European) based on aggregate school enrollment data from the Ministry of Education. Though this sampling method was appropriate for the primary study and provided high-quality data for subsequent studies, sampling for future research will depend on the study questions.

A total of 28 schools were randomly selected across the resulting nine strata, using probability-proportional-to-size sampling methods (schools with a larger proportion of the total number of Year 8 students in each stratum had a higher probability of invitation). A school may have been selected for recruitment of students from more than one ethnic group, and the sampling method allowed for a school to be selected multiple times for the same study stratum. Stratified sampling was used to better facilitate comparisons of marketing exposure by SES and ethnicity, as childhood obesity is strongly patterned by these factors, as are many public health exposures and outcomes.
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