

**Backyard chicken keeping in the Greater London Urban Area: welfare status,
biosecurity and disease control issues**

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Abstract. 1. The aim of this study was to collect baseline data on welfare, biosecurity and diseases of backyard chickens kept in the Greater London Urban Area (GLUA), United Kingdom (UK).

2. A total of 65 backyard chicken flock-keepers were recruited from May to July 2010 through adverts on websites, at City farms, veterinary practices and pet feed stores and surveyed by means of a questionnaire; 30 were eligible for analysis.

3. Information on keepers' and flocks' characteristics, housing and husbandry practices and owners' knowledge of health problems in chickens and zoonotic diseases was collected. A welfare assessment protocol was developed and the flocks assessed accordingly.

4. Results showed that chickens were generally provided with living conditions which allowed them to perform their natural behaviours.

5. Most of the flock owners did not comply with the regulations of the Department for Environment, Food and Rural Affairs (Defra) on the feeding of catering waste.

6. Disease prevention measures such as vaccination and biosecurity, including limiting the access of human visitors, wild birds and rodents to the flocks were rare.

7. A lack of avian and zoonotic disease knowledge and awareness among the owners has implications for disease control and highlights the need for improved communication between owners, authorities and veterinarians.

INTRODUCTION

Over the last few years, poultry, officially considered as a 'farm species' (even when kept as pets), have become more and more prevalent in the backyards of households in urban areas across the UK. Indications of an increased interest in the farming of

chickens in this type of environment have been evident in the press (BBC News magazine, 2004; The Independent, 2004; Country Life, 2008; Mail Online, 2008; Metro, 2009; The Telegraph, 2009) and are also corroborated by the number of hens rehomed from commercial farms to private premises – in around seven years over 200,000 hens have been rehomed in the UK, with an estimated 5% of them in London alone (J. Howorth, British Hen Welfare Trust, personal communication). Registration of small flocks (<50 poultry) with the Great Britain Poultry Register is voluntary and a precise number of such poultry and the flocks in which they are kept is not available. However, a representative of the National Farmers' Union poultry board 'believes the number of backyard hens in Britain may now be approaching three million' (The Ranger, 2011).

Currently, academic research providing insights into the health and farming practices in backyard flocks in the UK, and in particular urban flocks, is scarce. However, videos accessible on the World Wide Web showing backyard chickens kept in unhygienic conditions, dipped in water to have their broodiness discouraged or bullied by another pet in the household (YouTube, 2008, 2010a, 2010b), give rise to concerns about the welfare of these birds. The "five freedoms" framework established by the Farm Animal Welfare Council (FAWC) sets the standard for the welfare of chickens in the UK and includes 1) freedom from hunger and thirst, 2) freedom from discomfort, 3) freedom from pain injury and disease, 4) freedom to express normal behaviour, and 5) freedom from fear and distress (FAWC, 2009). The third freedom highlights the necessity to prevent and control poultry illnesses. To achieve this, a wide range of measures such as surveillance, biosecurity, vaccination, slaughter and treatment needs to be applied. Some important poultry diseases present in the UK have both welfare implications for the chickens and

financial significance for the farmers. Examples are Infectious Bronchitis, Infectious Bursal Disease (Gumboro disease), Marek's Disease, Infectious Laryngotracheitis, Pasteurellosis and Coccidiosis. On the other hand, infections such as Salmonellosis and Campylobacteriosis are a potential risk for human health. These are the two most frequently occurring food borne diseases in the UK (Health Protection Agency, 2011a) and are targets for disease control in the animal host. The incidence of less common zoonoses like Leptospirosis and Rat-Bite Fever could also be affected by the presence of backyard flocks and their feed (Health Protection Agency, 2011b; Langton *et al.*, 2001). Avian Influenza and Newcastle Disease, although currently absent from the UK, are subject to international surveillance and control due to their trans boundary spread and serious consequences for the industry (Food and Agriculture Organization). Moreover, highly pathogenic Avian Influenza viruses pose a serious risk to human health with deaths due to the strain H5N1 reported worldwide in the last seven years (World Health Organization, 2011). Backyard flocks have played a role in outbreaks of both Avian Influenza and Newcastle Disease in many countries in the world, including Italy (Capua *et al.*, 2002), Thailand (Tiensin *et al.*, 2007), Nepal (Defra, 2009), Egypt, Bangladesh, India, Indonesia and China (Food and Agriculture Organization, 2010).

Information about management and health of non-commercial poultry flocks in developed countries can be found for the United States of America (USA) (Graber *et al.* 2007), New Zealand (Zheng *et al.*, 2011) and UK (Defra, 2006) but little is known about the welfare of backyard chickens in the UK, the disease awareness of the owners and their activities in relation to biosecurity. Hence the aim of this study was to generate baseline information about flock characteristics, housing conditions and owners' knowledge about common poultry diseases and chicken keeping

practices in the Greater London Urban Area (GLUA). The objectives were: 1. to assess the welfare of the flocks and 2. to identify potential disease control issues.

METHODS

Overview

For the purpose of this study, backyard chickens were defined as chickens (*Gallus gallus*) owned by residents of the GLUA and kept there. The Office for National Statistics (2004) defines 'urban area' as "*an extent of at least 20 hectares and at least 1,500 residents at the time of the 2001 Census*". Convenience sampling was used to recruit backyard chicken holders from May to July 2010. Information was collected via a questionnaire and a welfare assessment was conducted separately using the gathered data.

Questionnaire and recruitment

A questionnaire consisting of closed-, partially closed- and open- ended questions was devised to collect information on various aspects of backyard chicken farming as summarised in Table 1. It was pilot tested with three flock owners with 'owner' being the person normally in charge of the flock. To attract a reasonable number of participants, various ways of reaching backyard chicken keepers were used. The survey was advertised on the websites of the Henkeepers Association (<http://www.henkeepersassociation.co.uk/>) and the Smallholder (<http://www.smallholder.co.uk/>) and in 10 City farms, 10 pet feed shops and 4 veterinary practices in the GLUA. Furthermore, authors of relevant articles in the press, individuals who had adopted chickens from the Centre for Animal Welfare at

the Royal Veterinary College and online advertisers of chicken keeping courses were contacted and invited to participate in the study. The same questionnaire was used for all participants in either face-to-face or telephone interviews, postal and web-based administration.

Welfare assessment

A protocol for the welfare assessment was devised based on the 'Five Freedoms' framework of the FAWC and the methodology described in the Welfare Quality® Assessment Protocol for Poultry (Welfare Quality® Consortium, 2009). In the latter, the overall welfare score of an animal unit, for instance, a section of a farm, is based on the summation of the scores of four welfare principles. The score for each of these is calculated by adding the results obtained for various criteria which are obtained through the measurement of aspects indicative of the welfare status of the animals belonging to the unit concerned.

For the protocol of this study, an animal unit meant a backyard flock. Each of the five Freedoms of the FAWC was denoted as a principle and subdivided into criteria relevant to it. Four of the principles had two criteria each and one (freedom to express normal behaviour) had five (Table 2). All principles were given equal weight and scored between 0 and 2 points, where a total of 2 indicated optimal or desirable conditions. Within each principle, the criteria included were also weighted equally so that their sum would be in the principle's range. For each principle, criteria were related to environmental and management conditions that could be assessed in the sample population by means of a questionnaire. In other words, no criteria were included that would require sample taking or clinical examination of the birds. All but three criteria (provision of red mite prophylaxis or treatment, provision

of prophylaxis or treatment for internal parasites and access to an outdoor run) were checked against the Code of Recommendations for the Welfare of Livestock: Laying Hens (Defra, 2002). The provision of access to an outdoor run was included on the grounds that it provides more opportunities for the expression of birds' natural behaviours like foraging, walking, scratching and dust bathing. The provision of antiparasitic prophylaxis or treatment was included because of the high prevalence of parasitic infestations reported in flocks with outdoor access (Permin *et al.*, 1999, Fiddes *et al.*, 2005). In addition, for the criterion 'Food' consideration was given to the existing ban on the feeding of catering waste (household kitchen waste included) to farm animals (<http://archive.defra.gov.uk/foodfarm/byproducts/documents/swill-leaflet.pdf>). Flocks fed partially or only on such waste received less points than those fed on ready-mixed feed alone or no points, respectively. The overall welfare score of a flock was the sum of all the principle scores of this flock (total 0-10 points). A score <7 represented welfare 'in need of improvement', a score from 7 to 9.5 was considered as 'acceptable' welfare and a score from 9.5 to 10 represented 'enhanced welfare'. The protocol was used for the assessment of all the sampled flocks.

Statistical analysis

Data from the study were summarised with descriptive statistics. The Fisher Exact test, Spearman's Rank Correlation and Kendall Tau-b were applied to measure the relationships between selected variables. Statistical significance was set at probability values smaller than 0.05. All statistical tests were performed with IBM® SPSS® Statistics (SPSS Inc., Chicago) Version 19.

RESULTS

Study sample

In total 65 people participated in the survey: 45 completed the questionnaire online, one returned it by mail and 19 were personally interviewed. From the 45 online responses, 18 were excluded from the analysis because respondents answered only \leq 25% of the questions or did not keep chickens at the time of completing the survey and 17 were excluded as they were from outside the GLUA. The final sample of 30 was formed of 10 online responses, 17 face-to-face and two telephone interviews and one response returned by post.

Owners' demographics

More female than male flock-owners took part in the study (20 vs 10) and there were more respondents from the age category 25 – 40 years (37%) than from any other. Nine participants held a managerial role and just as many had a professional or an associated professional and technical occupation as classified by the Standard Occupational Classification (2000). Students and housewives were represented by six respondents. Children were present in 10 out of 29 households and 17 from 30 respondents reported that all household members interacted with the flock. When responding to the partially closed question about their motivation to keep chickens, 29 respondents stated 'for eggs', 22 'for pets' and one 'for meat'. 'Educational purposes' was a motive for two participants who also had children but we could not detect an association between their presence and this motive ($p=0.11$, Fisher exact test). More than half of the respondents (18) had at least one other pet, most often cats (47%) or dogs (20%).

Flock characteristics

More than 20 breeds were identified among a total of 157 birds from 28 flocks with the most popular being the Sussex varieties (26%) and Maran (22%). Eight flocks kept unnamed hybrids and twice as many (17) consisted of multiple breeds. The flocks were small (mode=3, median=4, range 2 — 37, n=29). Five of them kept roosters. Fourteen respondents reported keeping birds of different ages with the age category '1 – 2 years' occurring most frequently. The birds in 10 flocks had been obtained from more than one source with commercial and backyard poultry holdings being the usual places of purchase (52% and 34% respectively). No import of birds from abroad was registered. The hatching of chicks in the households was reported by nine owners.

Welfare status

The results from the welfare scoring are presented in Table 2. The overall weighted score across all 5 principles ranged between 5.1 and 10 (median=8.50, first quartile=7.50, third quartile=8.57). Six flocks were considered to have welfare 'in need of improvement', 19 flocks had 'acceptable welfare' and five had 'enhanced welfare'. In 25 of all 30 flocks the owners failed to comply with either the requirements for not feeding any kitchen waste to the chickens or/and to supply fresh tap drinking water on a daily basis. Furthermore, 20 participants indicated that they did not provide any prophylaxis or treatment for red mites (11) or internal parasites (17). In three flocks bedding/litter and perching space were not available. All but one flock were protected against predators. For six criteria only maximum points were obtained: protection from adverse weather conditions, space allowance per bird (mean=2.73 m², range 0.31 – 14.25 m²), provision of nesting boxes, presence of

company from the same species, handling of birds other than by their heads, necks or wings and access to an outdoor run.

Management practices in relation to biosecurity

Table 3 presents a summary of factors related to the biosecurity of the flocks. A cleaning routine with intervals ranging from daily to monthly was recorded. The majority of keepers (87%) did this every two weeks or more frequently and half of them also used a disinfectant. It was expected that premises with smaller spaces allocated to each bird would be cleaned more frequently due to faster soiling with droppings than premises with larger spaces but no correlation between these factors was found ($p=0.42$). A third of the respondents used separate shoes or clothes while they cleaned the chicken house and three quarters always washed their hands after interacting with the chickens. None of the participants reported to travel with the flock to poultry shows, markets and other animal gatherings. Visits to such gatherings by household members alone were not frequent either. While the sharing of any chicken related equipment or chickens with other owners and the keeping of other avian species in the same space was rather uncommon (one flock each), access to the birds for visitors was usually not restricted and both rodents and other avian species were reported to have access to the chicken feed and water quite often (70% and 66% respectively). Other birds most frequently observed in the chicken premises were various wild birds, such as pigeons, finches, sparrows and robins but not waterfowl or birds of prey. Half of the flocks had a history of vaccination before coming into the respondents' possession but only one owner got his birds vaccinated. The practice of washing the eggs, a potential health hazard for people as pathogens may be moved from the surface of the shell into the inside of the egg (Hutchison et

al., 2004) was reported by more than half of the owners and eggs were the product most commonly sold or given away to friends, family, neighbours and colleagues. The most widely used methods recorded for disposal of dead birds were 'garden burial' and 'general rubbish'. Neither composting of dead birds' bodies nor feeding them to the flock was reported. Fallen stock could be a source of pathogens and toxins for other species (Smart et al., 1987) and the ways used for its disposal are important for preventing disease transmission. Just over half of the participants would look for veterinary help in case of any illness in the birds and a quarter would consult a veterinarian for general chicken keeping advice. The most popular source of information for both disease and chicken keeping in general was reported to be the Internet (74% and 68% respectively).

Owners' views on chicken health problems and selected diseases

When asked to list the main health problems in chickens (an open-ended question), five participants did not provide a response, three were not aware of any and 22 listed a total of 14 conditions (range 1-7, mode=1, mean=2.36). Ecto- (mites, fleas, lice) and/or endo-parasitic (coccidiosis, worms) infestations were mentioned most frequently (91%), followed by Mycoplasmosis and egg binding (23% each). The remaining health conditions were mentioned by less than a fifth of the participants (Figure) and some other important poultry illnesses like Infectious Laryngotracheitis and Pasteurellosis were not listed at all. Only a quarter of the owners of vaccinated flocks were able to name the conditions for which the immunisation had been given. Of 30 respondents, 21 did not know that Campylobacteriosis could affect human health and 6 respondents each were not aware of the zoonotic impact of Salmonellosis and AI. No correlations were found between the owners' awareness of

chicken health problems and the use of separate clothes/shoes or the washing of hands after interacting with the flock ($p=0.88$ and $p=0.76$ respectively, Kendall tau b).

DISCUSSION

To our knowledge this is the first study exploring welfare and health issues related to backyard chicken holdings in the Greater London Urban Area. The study identified areas of concern where communication between owners and authorities needs to be improved and where disease knowledge of owners could be enhanced, assessed the welfare of the flocks and described details of factors related to their biosecurity. Data obtained will also be useful for epidemiological disease transmission modelling in backyard chicken holdings.

The results showed that the backyard flocks were generally provided with a living environment allowing them to perform their natural behaviours such as scratching, pecking, foraging, nesting, roosting and dustbathing. This finding is important because it has been demonstrated that deprivation of the birds from, for example, perching and dustbathing, result in reduced welfare due to frustration (Olsson and Keeling, 2000) and feather pecking (Vestergaard et al, 1997). In addition, the availability of outdoor runs to all flocks reflects well the perception about what good animal welfare entails according to consumers from several European countries, including the UK (Miele and Evans, 2005). On the other hand, the use of such runs increases the risk of predation and thus could reduce the welfare due to possible injuries and death or stress related to fear of predators. This is of particular relevance for one flock from our sample which was exposed daily to potential attacks from birds of prey.

As the respondents were recruited through convenience sampling, the representativeness of our results is limited. Bias might have been introduced through the participation of those owners who were more willing to share their chicken keeping expertise or were more confident in it. Limitations of the proposed welfare assessment method are that all principles are given equal weight and so are the criteria within each principle. This approach in the assessment may not truly reflect the welfare state because it does not take into account the relative importance of principles and criteria to the birds. In addition, for reasons of practicality our method focused on management and environmental factors and did not include, for example, examinations for presence of injuries or disease or behavioural observations which would have allowed for a more comprehensive coverage of the principles.

An important finding was that about three quarters of the flock owners did not comply with the ban on feeding catering waste to their birds. Possible explanations are that they knowingly break the regulations or they are not aware of them. Considering that it is unlikely that a breach of law would have openly been admitted in the survey, the latter is more realistic. Such a ban perhaps does not make an intuitive sense to the owners and probably the feeding of kitchen waste is perceived as a way of utilising the household resources at a maximum level which is very much in line with the advice on the feeding of backyard chickens that can be found in older literature (Hobbs, 1920; Luttmann and Luttmann, 1976; Kay, 1977). The possibility of using waste food as livestock feed in future is currently being explored (Defra, 2011). However, in today's context this practice shows lack of awareness of legislation and also questions the extent to which the law is communicated and applied in backyard flocks. A short publication by Defra clearly states that *"it has been illegal to feed catering waste to farmed animals in the UK*

since 2001" and it includes waste food from household kitchens

(<http://archive.defra.gov.uk/foodfarm/byproducts/documents/swill-leaflet.pdf>).

Because chickens are officially classified as farmed animals, this legislation applies to any type of chicken holdings in the UK. This measure was enacted because of the ability of some disease agents to survive in food products and thus facilitate the spread of the disease. Feeding chickens with chicken meat and eggs carries the danger of spreading, for instance, the virus of ND since it is known that this virus can preserve its infectivity for weeks in frozen carcasses as well as in eggs (Hirsh et al., 2004c). Another example is the virus of Gumboro disease which has proven its viability in chicken products even after heat treatment (Mandeville et al., 2000).

Feeding swill to chickens has been suspected as the cause of the 1994 ND outbreak in Switzerland (Schelling et al, 1999). In addition it is not only the potential for disease transmission associated to the kitchen waste feeding but also the uncertainty about the nutritional characteristics of this type of feed and its welfare impact for flocks fed only on it.

Also of concern is the fact that 40% of the flock owners would dispose of dead birds by burying them in their gardens when in fact the proper methods for this purpose such as incineration, rendering and others (Animal Health, 2011) should be used so as to assist prevention of disease spread through groundwater and wild species.

The washing of eggs, found to be commonly practiced by the keepers is of relevance to food safety. With this practice the problem is how the eggs are washed. It has been shown that wash and rinse water temperatures lower than 34°C play a key role for the ingress of widely spread bacteria such as *Salmonella* (Hirsh et al., 2004d) into the contents of the eggs (Hutchison et al., 2004) thus turning the latter into a

potential source of infection for consumers. Despite the potential risk of zoonotic disease transmission linked to this practice, there is no breach in law provided that if the eggs are sold, they are sold at the production premises, in door-to-door sales or ungraded in local public markets (Defra, 2010b).

A serious concern is the low level of awareness demonstrated by the owners about diseases like Marek's Disease, Infectious Laryngotracheitis and Infectious Bronchitis which were diagnosed in backyard flocks in the UK in the recent past (Defra, 2010a). Transmission and spread of such diseases could negatively affect birds' welfare (Hirsh et al., 2004a, 2004b). The lack of knowledge about zoonoses among backyard chicken keepers in the GLUA is another important finding. For instance, Campylobacteriosis is one of the leading foodborne diseases worldwide (World Health Organization, 2010) and in the UK (Health Protection Agency, 2011a). The presence of chickens and their faeces which contain the disease agent *Campylobacter jejuni*, has also been shown to be a major risk factor for diarrhoea in children (Grados et al., 1988). Since children are reported to be present in more than a third of the chicken-keeping households, they may be at risk of contracting the disease. Future studies involving testing of the birds would enable the assessment of the proportion of infected birds and thus the risk of disease transmission.

The deficiency of knowledge about health problems and relevant regulations shows how important it is for the owners to have accessible and reliable sources of information related to the keeping of chickens. In this study, Internet sources were most commonly used by owners to get information about both chicken illnesses and general chicken keeping issues. However, Defra's publication concerning the regulations about catering waste is, in fact, freely available on the Internet and is also formulated in a way that is supposed to be understandable by lay people. This may,

therefore, raise the question as to whether chicken keepers do not look for such specific information because they consider their birds to be pets and thus a private matter; or what the nature and credibility of information available on other sources is. In this study it was not possible to draw any conclusions on that issue and it remains open to further research. Our findings clearly indicate a communication gap between authorities and chicken keepers. Making information available and easily accessible through the most widely used channels is of high priority from a disease control perspective, in particular for notifiable exotic diseases characterised by quick spread and devastating effect, such as Avian Influenza and Newcastle Disease. In addition to the insufficient knowledge demonstrated by the owners about the most important infectious diseases, the survey results also showed that the majority of the backyard flocks is at risk of introduction of infections in multiple ways. These findings are similar to the ones reported for smallholdings in the USA (Graber *et al.*, 2007), New Zealand (Zheng *et al.*, 2011) and the UK (Defra, 2006). At the same time only one keeper has voluntarily registered their birds with the Great Britain Poultry Register (GBPR). Potential reasons for non-registering may be that owners of backyard flocks feel insignificant, because they consider the veterinary authorities to be primarily involved in the protection of commercial poultry producers and do not regard backyard flocks to be important for disease transmission, or do not see any benefits from being registered. In any case, from a disease control and consequently welfare point of view, this low level of registration may affect negatively the speed and effectiveness of disease mitigation measures in case of an outbreak.

The results also showed that nearly half of the flock owners would not seek veterinary help in case of illness in the chickens. This raises questions regarding the

adequate treatment of sick animals and related suffering in case of incorrect or no treatment. Furthermore, it strongly limits the diagnosis and reporting of notifiable diseases and therewith the containment of outbreaks to prevent further spread. It could be speculated that the limited knowledge about regulations indicates that backyard flock owners are not aware of their obligation, by law (Office of Public Sector Information, 1981), to report certain diseases. The questionnaire does not inform on the specific motivation behind the unwillingness to look for professional advice. However, issues mentioned in personal interviews were cost, lack of availability and expertise of veterinarians. The following quote from one of the respondents reveals how the keeper - veterinarian relationship can be impaired by improper attitude: *"One attitude I've come across in the veterinary profession is that of "it's just a hen, it's not worth it" with the 'worth' being that of financial loss as if it were farming. Plus I've experienced what I felt to be a lack of interest/lack of giving out information when I've asked a vet for information. I 'want' to look after my hens humanely, so to me, that means trying to educate myself about their needs so they can be healthy and able to express normal hen behaviours, and it's dispiriting when the vet is not forthcoming. It's not as if I expect the information free-of charge."* Quantification of this type of experience is not possible from the data we collected but they nevertheless should not be ignored. Instead, increasing the awareness of urban clinicians about the presence of this apparently expanding pet-sector might possibly lead to the provision of adequate supply of veterinary services to meet the demand of these clients.

Even though evidence from our study shows that flock owners provide enriched living conditions to the chickens, they ought to realise that their pets are a farmed species and are subjected to regulations. They need to expand their

knowledge beyond the diseases for which there has been much publicity, like Salmonellosis and Avian Influenza, and be aware of the fact that some diseases must be reported. As part of their responsibility to ensure the welfare of the species kept, they should be aiming to obtain related information of good quality and this may be questioned when the Internet is their primary source. At the same time, chicken keeping organisations and regulators could support them by devising a single concise booklet specifically for the growing population of backyard chicken keepers, advising on legislation, duties and important diseases and disseminate it through the most popular information channels among the keepers. For such an initiative, collaboration from retailers of chickens and chicken keeping equipment and feed might be sought. The booklet could also incorporate information on zoonoses transmitted by rodents since it is likely that the presence of the chicken feed in the households would attract more of them (Langton et al., 2001) and thus increase the risk of transmission of diseases like Leptospirosis, Rat-Bite Fever and other zoonoses (Health Protection Agency, 2011b). In fact, several months after completing our study, a similar publication addressing the keeping of pigs as pets was made available online (Animal Health, 2010) which confirms that our suggestion is feasible. The recommendations made should help to enhance both animal welfare and public health given the likely increase in the numbers of chicken keepers in the GLUA in the future.

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