

# Raising Chickens in City Backyards: The Public Health Role

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**Abstract** There is increasing interest in raising chickens in urban settings across North America. Current regulations on backyard chickens vary by jurisdiction due to concerns about perceived health threats. Proposed negative impacts on public health and community well-being include infectious diseases acquired through rearing practices or consumption of eggs, inappropriate waste management, interaction with pests and predators and nuisance factors such as noise and odour. Proposed benefits are derived largely from the human-animal bond and from feelings of autonomy over food selection. The importance or validity of claims of positive and negative effects cannot be supported by literature specific to the urban agriculture context. Public health practitioners might approach this issue

in a manner analogous to concerns over keeping domestic pets.

**Keywords** Public health practice · Zoonoses · Environmental health · Urban agriculture

## Introduction

Human history is one of close association with the animals we eat. For much of the world, there remains a close cohabitation of people and animals [1]. Urban backyard birds used to be common throughout North American cities but urban planning and development and associated municipal bylaws have pushed livestock out of the cities over the past few decades. The urban agriculture movement aims to change this. From the 100-mile diet [2] to the concept of slow food [3], there is growing interest in local food production. Urban agriculture includes growing fruits and vegetables in the backyard in addition to raising livestock for food. Multiple jurisdictions already allow raising animals in city backyards, including rabbits, goats, ducks, and geese. North American cities including Portland, Oregon, Seattle, Washington and Vancouver, British Columbia (BC) allow keeping chickens in urban backyards. However, other cities continue to debate or prohibit urban chickens due to concerns such as noise, odour and pests.

For many urban dwellers, their connection with food animals is largely restricted to meat products in the grocery store. This disconnection creates unfamiliarity with livestock rearing practices. Response to unfamiliar risks tends to be influenced by the level of potential dread or severity of the hazard [4]. The spectre of pandemic avian influenza and its association with urban poultry in Asia has elevated

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the level of dread of urban chickens. Non-commercial poultry and backyard flocks have been viewed as points of possible vulnerability, affecting a jurisdiction's ability to detect, contain and eliminate avian influenza [5]. The historic link of commercial poultry with salmonellosis and campylobacteriosis [6] reinforces concerns that backyard birds will present a risk of enteric diseases. Further public health concerns about the attraction of pests to backyard flocks and the creation of neighbourhood conflicts has led to calls by opponents of backyard poultry that public health practitioners take a stance on the reintroduction of chickens to our cities.

Proponents of urban agriculture cite enhanced food security and safety, benefits of the human-animal bond and reduced environmental impacts as health benefits of backyard chickens. Their position often suggests that reductions in industrialization and intensification of poultry production arising from more backyard farming will in fact reduce infectious disease risks and reduce public exposure to drugs and chemicals in the food chain. Control over local food systems has been promoted as a key means to creating vibrant and sustainable communities [7]. Proponents also look to public health practitioners as arbitrators of this debate.

The objective of this paper is to examine the basis in published evidence to support or refute claims of positive or negative public health impacts from backyard poultry farming. Our goal is to reflect on this evidence to help public health practitioners develop their position on this issue and guide recommendations they may feel compelled to offer in their jurisdiction. This paper does not consider the implications of backyard poultry from an animal health and international trade perspective nor does it enter into the debate on the animal welfare issues associated with this topic.

## Methods

A comprehensive review of the scientific literature in Agricola, CAB Direct, Google Scholar, Medline, Pubmed, Scopus and Web of Science was conducted in December of 2009. Material was also found using Proquest Dissertations and Theses, Google, government and public health department websites, and library catalogues. The search strategy employed controlled terms and free text, and was adjusted according to the database being searched. Broadly, three major concepts were searched: (1) Chickens; (2) Backyards; and (3) Public Health. Bibliographies were reviewed to locate additional relevant material and to search forward using Scopus, Web of Science, and Google Scholar. References were limited to English-only; no date restrictions were employed.

## Results

### Possible Benefits of Urban Backyard Chickens

#### *Chickens as Social Determinants of Health*

Raising chickens in city backyards is not significantly different from owning a conventional companion animal such as a dog or cat. Backyard chicken owners view their birds as pets or companions and have emotional attachments to them [8]. In a survey by the US Department of Agriculture, the most common reason cited for having backyard flocks based was fun/hobby, followed by family tradition, lifestyle and food [9]. Other reasons for having birds included exposing children to food production, a general affection for birds, and insect control [9]. There is a long history of keeping chickens as pets, and according to one source they can be interesting and friendly companions [10].

Companion animals contribute to improved psychological health, including facilitating social interactions between people, and reducing feelings of loneliness, isolation and depression [11]. In an Australian survey, pet ownership was positively associated with social contact and interaction, and with perceptions of neighbourhood friendliness [12]. Pet owners scored higher on social capital and civic engagement scales [12]. Hypothetically, urban backyard chicken owners within the same neighbourhood may develop a heightened sense of community and belonging through shared discussions about their birds. Although reports of the social value of chickens are currently anecdotal, backyard chickens provide children and adults the opportunity to interact with their natural environment in the outdoors and may contribute positively to improved psychological health.

#### *Chickens as Economic Determinants of Health*

Proponents of urban agriculture cite the sense of personal control over food choices and recognize the social value of food, as opposed to seeing food as mere sustenance and a source of income [13]. However, some do claim economic benefits associated with egg production for personal use. A cost-benefit evaluation was not found in the Canadian literature to support this supposition. Eggs are the typical commodity discussed as many jurisdictions do not allow rearing of chickens for meat production. Literature on the economic advantages of small scale family poultry production is largely restricted to low and middle income country settings and cannot be generalized to the North American setting. Costs associated with keeping backyard chickens may negate any financial savings from reduced need to purchase eggs. These costs will include: purchasing

hens, chicken housing and equipment, feed, and veterinary services [14], including disposal of deceased hens. Depending on the number of hens being raised, they may not lay enough eggs to meet the needs of the household, requiring that eggs still be purchased commercially. A hen's weekly egg production volume can vary, as egg production is affected by day length, disease, breed, nutrition and stress [15]. Additionally, hens have a relatively short life span [16] and egg production will decrease as hens age [17]. Whether the initial investment in chickens and housing plus ongoing costs related to food and veterinary services will payoff in terms of egg supply requires further analysis but perceived economic benefits should not be the main reason for raising urban chickens.

#### *Chickens for Improved Nutrition and Food Security*

According to the Egg Nutrition Center which provides scientific information on issues pertaining to eggs and health, the nutritional value of eggs is affected only by the hen's feed [18]. The nutritional quality of eggs produced from urban backyard hens will, therefore, depend on the type and quality of feed chosen by the backyard flock owner. Matt et al. [19] compared the effects of organic versus conventional poultry housing systems on the biochemical composition of eggs. The mean content of cholesterol and potassium were higher in organic eggs; however, calcium levels in organic eggs were lower compared with conventional eggs [19]. In one egg testing project, eggs from hens raised on pastures were compared against US Department of Agriculture nutrient data for commercial eggs [20]. The results indicated that free-range eggs had elevated levels of vitamins, omega-3 fatty acids and beta-carotene, but these birds ranged freely or had access to fresh pasture [20]. However, these results have not yet been published in a peer reviewed journal. For some Canadian jurisdictions that allow urban backyard birds, bylaws stipulate that the birds must remain enclosed at all times, drawing into question whether they would be truly free-range birds.

Similar to the assessment of the economic benefits of family food production, most literature on food security and backyard poultry is concerned with impoverished and subsistence settings. Food security, in the sense that all people in a community have access to safe and nutritious food all the time, is not the context typically emphasized when discussing urban chickens in Canada. Backyard production tends to focus on personal consumption rather than re-distribution of production to those with food needs. Restricting production to backyards implies backyard farmers will be homeowners or renters with backyards and thus have a certain level of financial capacity. More often, food security is discussed in a personal sense and focuses

on the issue of control over food sources and personal autonomy over food choices. A community-based food security focus tends to deal more with how a local geographic area can reduce its dependence on imported foods [21]. The impacts of backyard production on personal or community food security seems, for the time being, to be a hypothesized rather than measurable effect.

#### *Chickens as Environmental Determinants of Health*

Environmental benefits of raising backyard chickens may include decrease in household waste through kitchen scrap consumption, the use of chicken manure as garden fertilizer, a decrease in garden pests and weeds, and a reduction in the carbon footprint. Chickens can eat some fresh kitchen scraps, but not to the exclusion of commercially prepared foods [14]. City-wide composting programs are becoming increasingly available and some people compost locally at home; therefore, the value of chickens in waste reduction is probably negligible, especially given that owners must also learn to properly dispose of, or compost chicken manure. Chicken fertilizers could have both environmental and economic benefits if used as a partial replacement for chemical-based fertilizers. Chicken manure can be a good fertilizer due to its high nutrient content [22]. Birds allowed to roam outdoors may eat garden pests and weeds but will also eat grass [23]. Requiring birds to remain enclosed will, however, prevent them from eating pests unless the enclosure is portable. Although local egg production may contribute to reducing the carbon footprint by reducing the transport of eggs from a distance to the consumer [24], this is still a hypothesized effect. Chicken keepers would still need to use transportation to obtain chicken supplies such as feed and would likely go to the grocery store to buy other food including additional eggs if their chickens did not produce in adequate amounts.

#### *Possible Health Risks of Urban Backyard Chickens*

##### *Infectious Diseases*

There are limited data from North American sources describing zoonotic infectious disease risks from backyard chicken flocks. Inferences from data on Asian backyard chicken flocks must be made cautiously as social and environmental conditions, and thus exposure routes and transmission, may vary greatly from North America. Similarly, risks in commercial flocks, including risks to poultry workers, may not be representative of those in backyard flocks and their keepers due to differing circumstances. Nevertheless, there exist a number of plausible routes of exposure for people to avian pathogens through backyard farming (e.g., direct contact, trauma, waste

**Table 1** Potential zoonotic diseases, poultry to human transmission

Bacterioses
Botulism
Campylobacteriosis
Colibacillosis ( <i>E. coli</i> )
Enterocolitic yersiniosis
Erysipelas
Listeriosis
Nontuberculous mycobacteria
Salmonellosis
Streptococcosis
Tetanus
Tick-borne relapsing fever
Mycoses
Aspergillosis
Candidiasis
Dermatophytosis
Chlamydiae, Rickettsiales and Viruses
Avian influenza
Chlamydiae (zoonotic)
Gastroenteritis (rotaviral)
Newcastle disease
St. Louis encephalitis
Parasitoses
Ancylostomiasis (zoonotic)
Baylisascaris
Chagas' disease
Cryptosporidiosis
Cyclosporiasis
Dermatitis
Dicrocoeliasis
Gnathostomiasis
Leishmaniasis (visceral)
Mesocestoidiasis
Tick infestations
Toxoplasmosis
Trypanosomiasis (African)
Infections caused by free-living amoebae

handling and egg consumption) in addition to avian pathogens that are zoonotic.

Although there are many bacterial, viral and parasitic zoonotic diseases of chickens [25], listed in Table 1, most research has surveyed flocks for pathogens of concern to other poultry and wild birds rather than zoonoses. Avian Influenza (AI) and salmonellosis are two exceptions. Avian influenza has received significant media and public attention and has been a major focus in commercial and Asian backyard chicken flocks. However, endemic diseases such as salmonellosis and campylobacteriosis pose ongoing health threats in the North American context due to

consumption of eggs, and handling of birds and their waste including manure and carcasses. The literature examining these risks has focused mostly on the commercial poultry setting rather than on backyard flocks.

There is a considerable uncertainty and variability surrounding estimates of both the prevalence of *Salmonella* and Avian influenza viruses in backyard chicken flocks and associated risks for disease transmission. Estimates of the diversity and prevalence of pathogens vary across geographic locations and levels of owner poverty. Heterogeneity in the housing conditions and sources of the birds will affect their exposure history and pathogen load. This variation can result in apparently conflicting data. For example, on the one hand large scale surveys employing viral culture as well as serology found no cases of AI in backyard flocks [26, 27]. On the other hand, chickens raised for hobby or recreational purposes in the Netherlands appeared to have been important risk factors for an epidemic of highly pathogenic AI in 2003 [28]. However, serologic tests of 24 domestic breeder flocks in the Netherlands found no antibodies against AI in the 12 birds tested from each flock while 2/24 flocks had antibodies against *Salmonella* serogroup B and 4/24 flocks had antibodies to *Salmonella* serogroup C [29]. A US seroprevalence study of 56 backyard chicken flocks in California found *Salmonella pullorum* in 4 out of 21 flocks or in 4 out of 48 birds while no AI was identified in 30 tested flocks [30]. While this information can serve as a proxy measure for likelihood of exposure for humans, predicting the likelihood of human transmission with any confidence is still challenging due largely to inadequate information on the transmission network between poultry and people in backyard settings.

The likelihood of *Salmonella* and AI transmission from chickens to humans through different modes cannot be accurately quantified. Two main routes of transmission are described in the literature for AI and *Salmonella* pathogens: fecal-oral and direct transmission [31–34]. While the potential for air-droplet transmission exists for AI in commercial poultry operations [31], it is less relevant for urban backyard chicken scenarios (limited number of birds, outdoor confinement and less potential for reaching high pathogen loads in adjacent air). Transmission occurs though direct contact with infected birds, their excretion and secretions or through contact with manure, contaminated equipment, and contaminated food/eggs (for *Salmonella* species). While AI is present in respiratory secretions, both pathogens are excreted with bird feces and represent a potential health hazard to humans due to the propensity to contaminate the adjacent environment through aerosolization [35, 36].

There are potential health risks associated with direct contact with birds and their eggs; however, the perceived

risk of AI from backyard flocks is probably overestimated due in part to media attention on this issue. Enteric infectious diseases warrant greater attention. In addition to transmission through direct contact, these diseases can also be transmitted through predators and pests and through chicken waste, which will be discussed below.

### Chicken Waste

Prompt and appropriate disposal of chicken waste, including manure and carcasses, is essential in minimizing disease risk, odour and flies. Pathogens including *Salmonella* and *Campylobacter* [37] may be transmitted from chicken manure to humans through direct contact with the birds, or through contact with chicken feces on eggs. Additionally, another pet in the household, such as a dog, could hypothetically transmit disease after eating chicken feces in the backyard followed by contact with a household member. The presence of chicken manure in soil can enhance the growth of fungi such as *Hisotplasma capsulatum*. Although chickens are not susceptible to infections, humans can be affected. However, histoplasmosis is not considered to be a zoonotic disease because the reservoir is soil, not chickens [38].

Exposure to chicken manure and subsequent disease risk will depend on factors such as hygiene practices of the owner (wearing gloves while cleaning up the manure), health of the animals, the amount of waste generated (dependent on the number of birds), the susceptibility of the individual (children, immunocompromised), and husbandry practices (proper clean up and disposal). Although chicken manure can be composted and subsequently used as garden fertilizer, sufficient heat during composting (>55°C) is required to kill any pathogens in the manure [39, 40]. Prompt removal of chicken manure will also help ensure the health of the chickens [14].

Most concerns regarding environmental impacts of poultry waste revolve around concerns over water contamination from large-scale farms. However, small scale farms can also contribute to water pollution given sufficient number and density and insufficient waste management. One study described the pollution of the Yangtze Delta in China from livestock and poultry rearing and recommended pollution control by shifting away from small scale animal husbandry to large-scale livestock and poultry farming units [41]. Most urban jurisdictions restrict the number of birds allowed and urban centres are rarely situated on important water supplies, thus greatly reducing this possible risk. Prompt clean-up and disposal (or composting) of chicken manure at the household would further reduce this risk. Chicken manure can be composted if proper precautions are taken to ensure pathogens are killed before application of the manure as a fertilizer. City

planners may need to anticipate the growth and density of backyard flocks in their jurisdiction as the number of urban households that will keep backyard birds grows. It is still unlikely that the quantity of waste anticipated would lead to significant water pollution in urban jurisdictions.

### Predators and Pests

Concerns about predators including raccoons and coyotes, and pests such as ectoparasites (mites, lice, bedbugs, fleas, and soft ticks) and premise pests (darkling beetles, flies, moths, cockroaches, and rodents) have been raised with regards to the keeping of backyard chicken flocks [42]. There are insufficient data to draw conclusions about the health risks associated with pests, predators and urban backyard flocks. Veterinary extension services literature aimed at commercial poultry flocks and rodent control provides some insights into this issue [43].

Rodents will eat and contaminate poultry feed (e.g., with *Salmonella*). In addition to transmitting disease [25], rodents carry lice, fleas and mites. They may scare chicken flocks by their movements or noises, and break and eat eggs. Rodents may also physically damage the chicken coop [43]. In commercial flocks, the volume of pests, including rodents, is determined by waste, housing and flock management practices [42]. Similarly amongst urban backyard flocks, health risks from rodents will likely depend on the cleanliness and security of the chicken coop, the health of the chickens, the nature of waste management and food storage. In North America, other premise pests, such as flies and cockroaches, are more likely to be a nuisance than a disease risk.

Predators such as raccoons are found in many urban jurisdictions [44]. If the hens are safely enclosed in their coop, this will act as a deterrent. However, raccoons may then leave *Baylisascaris* (raccoon roundworm) [44] or other pathogens in the backyard, posing a risk for household members, especially children. Dogs can also act as alternative definitive hosts for *Baylisascaris* [45].

### Nuisance Factors

Some jurisdictions [46] have decided against backyard chickens on the basis of nuisance factors such as noise. A hen will squawk during egg-laying for up to 5 min; according to noise readings conducted by the city of Pleasanton, California, the noises from a squawking hen at 2 feet away registered at 63 dBA (decibels-A level) [47]. Dogs may be perceived as a greater problem in neighbourhoods where barking may exceed 100 dBA [48]. Although these vocalizations from hens may lead to conflict between backyard chicken owners and their neighbours, minimizing the allowable number of hens and



prohibiting roosters in backyards should minimize disruptions and conflict.

Odour associated with chicken manure or food scraps may also create conflicts between backyard farmers and their neighbours. Although unlikely to have adverse health effects, neighbours may find the smells associated with backyard flocks offensive, especially if there is a perception that coops are not being maintained or if the neighbour is not in favour of backyard chickens. Keeping coops clean and appropriately disposing of waste should minimize such disruptions.

## Discussion

### Risk Mitigation and Public Health Response

The public health risks and benefits from backyard poultry cannot be quantified based on current published evidence but instead must be judged on opinion and analogy. Although the decision on whether to allow urban backyard chickens should be left to individual municipalities and their constituents, public health practitioners can expect to continue to be asked for their views on this practice as the urban agriculture movement gains momentum. Public health practitioners can serve a valuable role as consultants and educators, recommending appropriate responses to risk perceptions in collaboration with animal health professionals. The public health response can include education, regulatory and economic elements. Each of these will be discussed below.

### Education

The educational messages associated with backyard poultry are not dissimilar to those for other companion animals. Linkages between primary care physicians, public health practitioners and veterinary medicine professionals will help ensure that education about disease risks from animals, including any emerging threats, is shared. Primary care physicians should routinely ask questions about animal exposures on history taking. Regulatory agencies licensing backyard flocks should provide educational materials to chicken owners on appropriate means for pest control, manure disposal and personal hygiene. In a household with children or immunocompromised individuals, healthy adults should be encouraged to clean up the feces, using gloves to avoid direct contact with the droppings and ensuring hand washing afterwards. A Missouri case-control study found that hand washing after handling ill chickens and ducklings was protective against illness [34]. Handling of birds should generally be minimized and they should not be brought into households. Young

children should be taught to wash their hands with soap and water after contact with all animals.

Whereas the principles and practices of on-farm biosecurity may be familiar to commercial farmers, hobbyists and backyard farmers may not be aware of the steps required to keep infectious diseases out of their flock and to prevent their spread. For example, to minimize the risk of avian influenza, backyard poultry should not be removed from the property or mixed with birds outside of their flock, and contact with wild birds should be prevented. Agencies such as the Canadian Food Inspection Agency have created educational material targeting backyard flock biosecurity [49] which can serve as a useful resource. Similarly, urban dwellers may be unfamiliar with food safety principles that need to be employed at the point of production like cleaning eggs prior to consumption and avoiding the consumption of broken or cracked eggs.

The urban chicken owner should be able to recognize overt illness in their birds and subsequently have access to poultry veterinary services for advice and treatment. State or provincial animal health agencies can contribute through poultry education programs for backyard flock owners and through veterinary outreach education for urban veterinarians who are not experts in poultry medicine. Online discussion boards for backyard poultry owners, with a moderator, can be one educational tool. There is also free on-line veterinary extension literature specific to raising poultry in the backyard setting, especially from United States sources. Technical expertise can also be gained from jurisdictions experienced in urban backyard chickens. Some veterinarians may be dealing with both commercial flocks and urban backyard flocks. Appropriate biosecurity measures must be encouraged to prevent transmission of disease between flocks.

Urban farmers inexperienced with animal rearing should be provided information on basic chicken husbandry principles that can mitigate public health concerns. For example, high quality food will act to keep hens healthy and produce eggs less likely to crack. Extra bedding in the chicken nest can prevent eggs from cracking or breaking. Dusting boxes with diatomaceous earth can be used to prevent pests such as red mites, which may end up in the household. Waste management strategies for the public can be guided by agriculture or veterinarian extension materials that can be provided at the point of licensing. Chickens produce most of their feces at night while roosting which makes clean up easier, and on average generate four ounces of feces per bird per day which is significantly less than a dog or cat. Coops should be designed to enable easy removal of chicken manure. Appropriate waste management practices must be undertaken to ensure proper handling of chicken manure and carcasses and to avoid odour and flies [16]. If chicken manure is to be composted, it

must be done safely and at recommended temperatures [50]. An understanding of rodent behaviour, including feeding patterns, is critical to minimizing their impact on the chickens. A properly constructed coop and food storage area ensures that rodents and other predators cannot enter. Removing loose food from the coop at night and keeping the general area clean will also help to discourage rodents [51].

### Regulation

Regulation is important in disease prevention, minimizing nuisance factors, and in ensuring animal welfare. In hopes of addressing these issues, some jurisdictions have implemented the following regulations: (1) licensing of birds, (2) prohibiting chicks and roosters, (3) limiting the number of hens allowed, and (4) providing specifications on coop construction, waste management and food storage. Requiring the registration of backyard flocks, as is the case in Vancouver, BC [52], may provide opportunities for risk management. First, it will allow a single point of contact with birds owners at which educational material can be provided. Second, registration will enable trace-back to flock owners should an event occur, such as incursion of a highly pathogenic form of avian influenza virus, requiring that rapid contact be made with backyard poultry owners. Third, it would allow city planners to avoid high density pockets of birds thereby reducing nuisance and waste management concerns. Prohibiting chicks will decrease the risks of *Salmonella* as many chicks carry *Salmonella* in their feces, and children are more likely to have close contact with chicks [53]. Banning chicks will also minimize the abandonment of hens once they grow up, and will ensure that there are no unexpected roosters in the flock once the chicks mature. Due to concerns about noise in many jurisdictions, roosters should not be allowed. Finally, regulations regarding coop construction, waste management and food storage will reinforce education aimed at minimizing nuisance factors and preventing disease and promoting health in humans and chickens.

### Economics

Companion animal care and ownership is legislatively a private sector concern. Investment in animal health typically is restricted either to settings where the animals produce significant economic values or present costly public health risks. Economic incentives for flock owners including free licensing of birds could help ensure that birds get properly registered and cared for. However, it is not clear if such public investment would result in further risk reduction or if backyard poultry present higher risks or benefits than other companion animals thus requiring

public investment into their care. Due to potential lack of poultry veterinary expertise in urban settings, one solution may be to recruit poultry veterinarians to collaborate with public health practitioners in offering a regular online web forum where chicken owners can request advice and information on bird and human health issues.

To discourage home slaughter of birds and inappropriate waste management, there should be cost-effective means of disposing of dead or sick birds. Vancouver, BC has proposed a shelter for unwanted or abandoned birds [52].

### Surveillance

All household pets come with potential risks to human health. However, existing surveillance infrastructure for pets in general and chickens specifically are not conducive to ongoing monitoring. Poultry surveillance is focused on commercial birds and requires laboratory and veterinary support. Attributing cases of human illness to ubiquitous pathogens such as *Salmonella* and *Campylobacter* from backyard chicken flocks will require that diagnostic and field investigative capacity be supplemented in most jurisdictions. Infectious diseases in humans attributable to companion animals are likely under-reported due to patients not consulting their physicians, lack of awareness amongst primary care physicians of disease transmission routes, and the absence of formalized surveillance systems. In jurisdictions allowing backyard agriculture, public health workers should be aware of this potential source of pathogen when investigating relevant disease outbreaks. Similarly, pest control companies could be asked to amend their call records to include a field about whether backyard chickens were present when they attended a household for pest control.

### Evaluation

Public health practitioners can provide expertise in designing and conducting an evaluation of urban backyard programs. Elements of an evaluation could include the number of households keeping birds, reasons for keeping birds, any health events in either humans or birds over a defined time period, calls made to inspectors, costs to owners and the municipality, complaints by neighbours, and calls to pest control companies from urban backyard poultry owners. The mandatory registration program would allow for access to all backyard poultry owners.

### Conclusions

There are limited validated data on the risks and benefits of urban backyard chicken flocks in North America and

Europe. It is not possible to make quantitative estimates of health risks and benefits. Analogies with commercial and Asian flocks should be drawn cautiously as husbandry skills, the number of chickens, amount and management of waste, and utilization of veterinary services will be different.

Overall, the risk of pathogen transmission given backyard chicken keeping appears to be low and does not present a greater threat to the public's health compared with keeping other animals allowed by similar bylaws such as dogs and cats. Public adherence to proper hygiene and animal husbandry will significantly mitigate the risk of any disease acquisition from pathogens commonly found in chickens. Proper care and maintenance of flocks will help to minimize nuisance factors. Education and regulatory strategies should be utilized to avoid or mitigate risks.

Public health professionals can guide decision-making by acting as consultants in collaboration with animal health professionals. Provincial and state animal health agencies can contribute through veterinary outreach education to local veterinarians and through educational programs to backyard poultry owners. The collaboration of animal and public health professionals will promote the most tangible benefits derived from the human-animal bond and choice in safe food products.

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