

Article

False Beliefs about Contracting Avian (Bird) Flu from Processed Poultry Products

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Abstract: Avian influenza (bird flu) occurs sporadically in American poultry flocks, decimating these flocks and causing substantial economic losses. Avian influenza also impacts the beliefs of food handlers and preparers in the home (home cooks). Although those who properly handle and prepare processed poultry products cannot succumb to avian influenza, there is a widespread belief that one can contract the bird flu from these foods. Beliefs about getting avian influenza from poultry products and intentions to avoid consuming poultry products are the focus of this study of 285 home cooks. False beliefs about getting avian influenza from handling, preparing, and consuming poultry products are apparent in this sample. Correlational analysis also shows that those holding the false beliefs intend to act upon those beliefs by planning not to consume poultry products. Moreover, the false beliefs about contracting avian influenza from poultry products are correlated with a bias to see oneself as less likely to produce food that contains foodborne diseases. These findings are consistent with, and contribute to, the research literatures on belief formation and change, behavioral intentions, and with research showing how guilt by association thought processes underlie false beliefs related to food safety. This research has important implications for poultry and other food processing industries, and for campaigns to persuade the public about real and imaginary risks associated with particular food products.

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1. Introduction

Sporadic outbreaks of avian influenza (bird flu) infections decimate wild and farmed birds. These outbreaks have great costs to poultry producers. The previous large outbreak of avian influenza (2014-15) in the United States resulted in more than 50 million birds being destroyed [1], costing the U.S. government \$930 million, and national economic costs of \$1 billion to \$3.3 billion [2]. Although humans are unlikely to contract avian flu from properly prepared poultry products, there are widespread beliefs that avian influenza in farmed poultry poses a risk to food safety. This paper reports the findings of a survey of home cooks in the American Upper Midwest focusing on their beliefs and intentions associated with contracting avian influenza from poultry products. These (false) beliefs are considered from the perspective of how people process information which can result in biases, misperceptions, and inaccuracies.

This report focuses on beliefs and intentions associated with humans contracting the avian influenza, with particular investigation of the (false) belief of contracting bird flu from consuming poultry products and intentions to avoid consuming poultry products because of the (mis)perception that humans can get avian flu from doing so. In addition, the relationship of these false beliefs about contracting avian flu from consuming poultry products is related to a bias to see oneself as less likely to produce food that is

contaminated or unsafe. The findings demonstrate the false beliefs and biased intentions shared among home cooks regarding risks from poultry products during an outbreak of avian influenza are associated with information processing related to misperceptions and biases.

1.1. Avian Influenza and Its Consequences

Avian influenza is a viral infection that naturally spreads among waterfowl worldwide, but can infect domesticated birds if they come in contact with infected birds, infected bird secretions, or surfaces contaminated with the virus [3,4]. The avian influenza virus has highly pathogenic and low pathogenic varieties. The highly pathogenic virus has high mortality rates among infected poultry (90%-100%). Low pathogenic avian influenza produces mild disease in poultry and may lead to lower egg production, but can mutate into the highly pathogenic variety. Both the high and low pathogenic varieties can spread quickly in flocks of wild and domesticated birds [3]. Consequently, poultry producers are alarmed about real and potential outbreaks of avian influenza that could enter their flocks. Moreover, consumers hear of these concerns about avian influenza in poultry and, by association, come to believe that processed poultry may not be safe for consumption.

Although food handlers and preparers as well as consumers may believe that poultry may not be safe during an avian influenza outbreak, these beliefs run counter to the evidence that humans cannot contract bird flu from eating properly prepared poultry products or from processed poultry products like chicken soup [5]. Because avian influenza is highly contagious within bird flocks, a misperception might follow that it can easily infect humans, although it rarely does [6]. Yet, if a human is infected with the avian influenza, specifically through direct contact, it can be deadly [7].

Similar to the avian influenza (bird flu) outbreak of 2014-15, the 2022 outbreak has been costly to American poultry producers with over 57 million birds affected [8]. Moreover, the 2022 avian influenza outbreak contributed to increased prices of eggs and poultry products during a period of other price increases [9]. At this time, there are no clear estimates of the economic costs to the U.S. government or to producers and processors of poultry products, but they are likely to be larger than those of the large 2014-15 outbreak. Every U.S. state which sustained an outbreak expects economic consequences (e.g., Iowa, Kansas, Minnesota; [10]). It will also take time for producers to recover from the loss of birds and to re-establish their flocks. Thus, like the 2014-15 outbreak, there will be many economic ripple effects of the 2022 avian influenza outbreak that will be felt throughout the poultry industry.

1.2. Information, Misperception and False Belief

Information, and the ways it is processed, are the bases of how judgments about events are formed. Similarly, beliefs about events are formed by processing available information, even if it is self-constructed. Beliefs can be defined as the person's subjective likelihood that some object is associated with some outcome (e.g., avian influenza in bird flocks relates to avian influenza in processed poultry products [11]). These beliefs are subjective, so they do not have to be based on accurate knowledge or logical information processing. Moreover, these beliefs derive from human experiences, interactions, and knowledge such that they reflect subjective perceptions which can be in error or mistaken [12]. Consequently, perceptions and misperceptions as well as beliefs and false beliefs reflect the same basic processes regardless of whether they are veridical or erroneous conceptions of the world.

To understand how misperception and false belief can arise for conceptions of avian influenza in processed poultry, it helps to recognize that the processes are similar for many aspects of health beliefs. In particular, there is much known about how information is processed under conditions of threat, uncertainty, sparse information, selective

information exposure, and risk in general [13,14]. This research also demonstrates that biased information processing can result in beliefs, and that information processing based on falsehoods can result in false beliefs. Consequently, there are a number of errors and biases associated with information processing involving our beliefs about situations related to threat, risk, and uncertainty [15] which share a general theme of guilt by association [16].

One example of the information processes associated with judgments of risk can be seen in a 2005 survey of Hong Kong residents concerning perceptions and misperceptions of human infection of avian influenza [17]. The residents' perceptions of risk and their reactions indicated that they expected the spread of avian influenza into the human population and with human-to-human transmission to follow. The respondents to the survey expected the avian influenza in humans to have a high fatality rate (70-74%), that there would be inadequate preparedness for an epidemic (44%-63%), and that family members would have very high susceptibility to contracting the disease (14-24%). These residents also expected that they would experience some emotional distress (18%), avoid visiting hospitals due to fear of avian influenza (20%), and eat less poultry (28%). Although the avian influenza epidemic in humans associated with the survey did not materialize, the researchers [17] noted that the dissemination of accurate and timely information about the risks of avian influenza in humans would mitigate the emotional distress and potentially inappropriate behavioral responses that would hinder effective interventions.

Humans are prone to errors and biases in judgment, and false beliefs are a form of judgmental error [16]. Importantly, these false beliefs can become quite pervasive in a society while also persisting in the face of corrective information [18]. Accompanying these false beliefs are conspiracy theories which have also emerged for avian influenza (e.g., fake news [19]). Not surprising, false beliefs can easily emerge in situations involving people's health. About 20 years ago, research [20] indicated that the average American spent about 84 hours per year reading magazines, 165 hours reading newspapers, 480 hours accessing the internet, and more than 1,200 hours watching television. In contrast, that average American spent less than one hour per year in a physician's office. Thus, the information about health that an American receives comes from a number of sources which are too often biased and incorrect. Accordingly, many researchers who study the processing of health information apply the health belief model which helps describe how health beliefs (accurate or false) are maintained, shared with others, are potentially contagious in social populations, and are often resistant to well-conceived interventions (e.g., [21]).

1.3. False Beliefs and Intentions to Act

Beliefs, including false beliefs, can influence subsequent actions. The beliefs that individuals hold can indirectly influence the immediate precursors of action called intentions [11]. The impact of intentions has been demonstrated for food safety (e.g., [22, 23]). Research has demonstrated strong relationships between people's intentions and their subsequent actions [24, 25]. Consequently, false beliefs about avian influenza could influence intentions to act with regard to these false beliefs (e.g., intend to avoid consuming poultry products [26]). These false beliefs can then result in the dissemination of false information as well as produce widespread misperceptions. All of which can result in the economic costs to food processors but also to consumers' emotional distress and inappropriate behavioral responses [17]. Consequently, this research examines intentions toward consuming poultry products during the 2006 outbreak of avian influenza in the United States.

1.4. False Beliefs and Food Safety Biases

False beliefs are biased perceptions which can impact actions. Moreover, the processing of information for false beliefs can spread to other beliefs such as conspiracy theories. By definition, beliefs are predicated upon associations and, as such, inappropriate associations can spread to the processing and interpretation of other information related to other false beliefs and biased misperceptions. One false belief that is pervasive among humans is that, in general, individuals perceive themselves as better than average in positive characteristics (e.g., [27]). One place where this is seen is in terms of who produces food that is safe and uncontaminated [28]. That is, most people have a bias toward positive conceptions of themselves, and that home cooks believe that they provide safer food than others on average would provide, including professionals. Would this better-than-average false belief be associated with a false belief that avian influenza makes poultry products unsafe?

Given that people have the same sets of beliefs and similar processes for how they interpret and process information, there may be a relationship between the false belief of contracting avian influenza from eating processed poultry and the biased belief that one's own cooking is safer than that of others. Consequently, in this research the potentially false beliefs about the safety of processed poultry products will be correlated with a measure of the bias toward producing safe and uncontaminated foods. The research questions outlined here are tested with survey questions among a sample of food handlers and preparers in the home during an outbreak of avian influenza.

2. Methods

2.1. Participants

The individuals who completed an online survey were female ($n=226$) and male ($n=59$) primary food handlers and preparers in their homes (age $M=40.39$; $SD=12.88$). A little over half of these 'home cooks' were recruited from e-mail solicitations of faculty and staff at North Dakota State University and Minnesota State University Moorhead. Additionally, the remainder of the participants were recruited from signs in grocery stores and an advertisement in the local newspaper asking recruits to complete an online survey about food preparation. The participants received \$20 in exchange for completing an online survey regarding food handling and preparation practices which included many questions regarding food safety attitudes, knowledge, and self-reported behavior (see [22,23] for examples of the latter of these kinds of questions). Participants who responded to the recruitment were directed to a website which presented the survey instructions and questions which the participants could complete on their computers. The participants received a written debriefing at the end of the survey.

2.2. Survey Items

Among the many measures in this survey, five focused on perceptions, beliefs, and intentions associated with avian (bird) flu in poultry products. The first question asked "How **likely** is it that bird (avian) flu will get into the chicken and poultry produced for American's food consumption?" Participants responded on a seven point extremely unlikely to extremely likely semantic differential scale. The second question assessed concerns: "I am very concerned that bird (avian) flu will get into chickens and poultry produced in America?" Responses were gathered on a seven point strongly disagree to strongly agree response scale. The third question was a food safety belief "How **much** do you believe it will influence food safety if bird (avian) flu gets into the chickens and poultry produced in America?" which was responded to on a seven-point scale ranging from (1) Not at all to (7) Completely. The fourth question was "If bird (avian) flu gets into American chicken and poultry, how safe do you believe it will be to eat chicken and poultry that you could purchase at stores? Responses were provided on a seven point extremely unsafe to extremely safe semantic differential scale. The fifth question about

intentions asked “If I hear that bird (avian) flu is found in American chicken and poultry, I intend to avoid eating chicken and poultry products.” which the participants gave on a seven-point strongly disagree to strongly agree response scale. The sixth question concerned bias about self-reported food safety, “How **likely** is it that the food **you handle and prepare** would be unsafe or contaminated?” which was responded to on a seven point extremely unlikely to extremely likely semantic differential scale.¹

3. Results

Table 1 presents the summary statistics of the mean and standard deviations for the responses of the home cooks to the survey questions as well as the intercorrelations among the survey items. The first four questions reflect beliefs about avian flu in poultry products and there were significant correlations among these items. The third and fourth item reflected beliefs about food safety from avian flu, and these items correlated strongly ($r=.60$). The fifth question concerned intentions to avoid eating poultry products and it was not correlated with the first two items of beliefs about avian influenza, but this intention item did correlate with the beliefs of food safety resulting from avian influenza. Consequently, assorted beliefs about the risks of avian influenza for poultry products and their safety for consumers were interrelated. Moreover, the questions about the safety of poultry products did relate to an intention to avoid eating these poultry products, but the intentions were not significantly related to beliefs about avian influenza getting into poultry products.

Table 1. Intercorrelations, mean values, and standard deviations for the survey items related to avian influenza and safe cooking.

Item	Mean	SD	1	2	3	4	5	6
1. Likely will get into poultry consumed	2.78	1.37	-					
2. Concerned will get into poultry produced	3.21	1.44	.564**	-				
3. Much believe it will influence food safety	3.85	1.61	.290**	.322**	-			
4. If gets into poultry, will it be safe to eat	4.03	1.78	.186**	.144*	.598**	-		
5. If is found in poultry, intend to avoid eating	5.38	1.54	.006	-.049	.136*	.359**	-	
6. Food you prepare is unsafe or contaminated	4.08	1.43	.397**	.497**	.285**	.104	.060	-

Notes: $N=285$ for all statistics. * indicates significance at .05 two-tailed, ** indicates significance at .01 two-tailed.

It is informative to consider the distributions of responses to the survey questions to understand the beliefs and intentions of the sample of home cooks regarding how avian flu in flocks would infect poultry products meant for consumption. For the first question, 74.4% believed it was at least slightly unlikely avian flu would get into the poultry food supply while 18.3% felt it was at least slightly likely to get into the poultry processed for consumption. For the second question, 57.9% of the sample at least slightly disagreed that avian flu would get into processed poultry while 25.3% at least slightly agreed that avian flu would get into American produced poultry. For the third question, 57.5% of the participants believed that food safety would be compromised if avian flu got into American poultry. For question four, 36.8% of responses indicated that the poultry

¹ This question was included in Wallace and Hinsz [28] as an item regarding optimistic bias. Results with regard to this question are reported in that chapter, but no analysis considered the topic of false beliefs associated with avian influenza in poultry products. This question is included in this paper to reflect the biased ways in which perceptions of food safety can be extended to consider avian influenza in processed poultry products.

products would be at least slight unsafe to eat whereas 47% believed that poultry and chicken would be at least slightly safe to eat. For the fifth question that dealt with intentions, 78.2% of the home cooks at least slightly agreed that they would avoid eating poultry products if they hear of an avian flu outbreak and only 12.6% at least slightly disagreed with that statement. The responses to this intention questions help us understand why the intentions differed in the degree they correlated with the belief questions (1-4). That is, even if the respondents didn't believe that avian influenza might affect the poultry products or the safety of these products, many survey participants would still avoid eating processed chicken and poultry if there was a bird flu outbreak.

The responses of these home cooks indicated that many of them held unfounded beliefs about the risks of avian influenza in poultry flocks for processed products they might consume. These false beliefs indicate a misperception about the risks of avian flu and a bias to avoid consuming processed poultry products because of the presence of avian influenza in American bird flocks. The responses to the four belief questions (1-4) indicate that these false beliefs were somewhat pervasive and are consistent with beliefs from other outbreaks of avian influenza in the U.S. (e.g., [29]). These false beliefs can be seen as biased perceptions about the impact of avian influenza which may resemble other biases. The response to the sixth question about the safety of one's own home cooking illustrates the potential for another bias of positive self-assessment (e.g., better-than-average [27,28]). The relationships between this question about the safety or contamination of one's own cooking and the responses to the five questions about avian influenza illustrates the relationship between these two biases. Interestingly, the positive bias to perceive the safety of one's own cooking was significantly correlated with three of the belief measures of the risk of avian influenza for processed poultry products, suggesting that the processes contributing to these biases were shared for different aspects of food handling and safety. Moreover, the positive bias of the safety of one's cooking did not correlate with intentions to avoid poultry products if there is an outbreak of avian influenza. This finding illustrates that home cooks might trust their own cooking but don't trust that others will produce food products that they will consider as healthy enough to eat.

4. Discussion

The survey responses from this research revealed that some home cooks had false beliefs about the consequences of avian influenza in poultry. These false beliefs are consistent with previous examinations of associations of avian influenza with health risks (e.g., [30]). Moreover, these beliefs related to intentions about consuming poultry products; intentions that can result in actions toward poultry products which have important personal, social, and economic consequences. These relationships were observed in a relatively large sample of home cooks in the American Upper Midwest, which coincided with the location of substantial avian influenza infections among domestic bird flocks.

The survey responses indicated that some of the beliefs related to intentions to avoid eating poultry products. Although the beliefs related to the safety of poultry products were more highly correlated with this intention, the results did demonstrate the anticipated relationship between false beliefs about avian influenza and intentions to avoid eating poultry products. The finding that beliefs were related to intentions follows from the description of the relationships between beliefs and intentions as precursors to action [11]. Consistent with this general literature, the results of this survey are consistent with findings showing that food safety beliefs for poultry products are associated with intentions toward food safety (e.g., [22, 23, 30]). As mentioned earlier, these intentions towards actions such as avoiding consuming food products can also affect economic losses in food production industries. Moreover, the beliefs that underlie the intentions can

have personal consequences such as promoting emotional distress about the threat and risk to one's own and others' health [17].

These false beliefs found for associations with avian influenza (bird flu) are related to general processes and problems associated with information processing and misperceptions. Research demonstrates that human perception and information processing often succumb to biases as well as false beliefs in general (e.g., [12, 14, 15]). In this study, a similar pattern of misperception and false beliefs were observed with regard to avian influenza and beliefs about the safety of poultry products. This pattern of false beliefs is similar in nature to a guilt by association bias that is prevalent among people and appears difficult to overcome [14, 16].

This study demonstrated the interesting finding that the false beliefs associated with avian influenza also related to a bias of self-confidence in producing safe food. The bias from the better-than-average literature seemed to relate to false beliefs about avian influenza in American poultry flocks. The correlation between the false belief and bias demonstrates how biases, errors, and inaccuracies in associations reflect the way food safety information is processed as well as interpreted, which then contributes to intentions to act based on the associations with food safety. For most considerations, it is these intentions to act that produce the important challenges for food production and food safety. Consequently, the models of intention and behavior generally recommend that interventions target the development of beliefs, and false beliefs in particular.

The communication and persuasion literature associated with informational campaigns offers methods for changing beliefs (e.g., [31]). Communications can attack and undermine false beliefs, which can be an initial step in reducing inappropriate intentions toward actions. Many public information campaigns applied to avian influenza utilize these methods as well (e.g., [5, 6, 7, 19]). These informational campaigns aim to disseminate accurate information so that people form appropriate beliefs as well as curb the formation of false beliefs [32]. Consequently, multi-media campaigns are often applied so that the right target, receives the right message, from an appropriate source, at the right time, and in the proper fashion, such that persuasion occurs (e.g., who, what, from whom, when, where, how).

Unfortunately, not all of these approaches to forming and changing beliefs and intentions will be successful. It takes professional perspectives based on research to properly utilize these evidence-based approaches such as found with the health belief model (e.g., [33]). For example, although fear appeals are considered to be powerful ways of conveying messages, fear appeals can easily result in effects counter to those intended [34]. Other approaches attempt to debias inaccurate beliefs [18], although these too are not often successful [14]. In addition to attempts to debunk false beliefs to reduce the impact of misinformation that leads to false beliefs, it might be possible to inoculate individuals against belief systems that run counter to fact [35]. In these ways, false beliefs, misperceptions, and perhaps conspiracy theories can be removed from public considerations surrounding avian influenza and the safety of poultry products.

5. Conclusions

Avian influenza has real consequences to food producers, home cooks, and consumers. The economic consequences of the current avian influenza outbreak in the U.S. are not yet known, but are likely to exceed those of the 2014-15 outbreak. Moreover, the personal consequences of the outbreak should not be ignored [17]. This study examined home cooks' beliefs about avian influenza (bird flu) in domestic poultry flocks and how they would impact their intentions to avoid consuming poultry products. Like other false beliefs, the different beliefs of the home cooks were interrelated as well as associated with the intentions. Moreover, the bias to see avian influenza as putting poultry products at risk for food safety was associated with a bias of home cooks believing that they produce food that is less likely to be unsafe and contaminated than food produced

by others. False beliefs pose a challenge to food production industries as well as assurances of a safe food supply. Multi-media informational campaigns and attempts to debias misinformation provide avenues for ameliorating the impact of false beliefs on the intentions and eventual actions of food handlers, food preparers, and food consumers. Such interventions offer a way to confront some of the informational and behavioral challenges posed by avian influenza infections in poultry flocks.

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