



## Predicting adolescents' safe food handling using an extended theory of planned behavior

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### ABSTRACT

The aim of this study was to investigate whether the Theory of Planned Behavior (TPB) with the addition of risk perception could predict safe food handling in a sample of adolescents from the UK and Australia over and above the explanatory power of knowledge. It was hypothesized that knowledge would predict both intention to prepare food safely and self-reported food hygiene behavior. It was expected that attitudes, subjective norm, perceived behavioral control and risk perception would predict intentions over and above knowledge. It was hypothesized that intentions and PBC would significantly predict food hygiene behavior over and above the influence of knowledge. Participants were recruited from secondary schools in Australia and the UK ( $n = 205$ ). Knowledge alone predicted 4% of intention and 1.4% of behavior. TPB variable with the addition of risk perception accounted for an additional 60% of the variance in intention. PBC and intention accounted for an additional 24% of the variance in behavior. Knowledge was not a significant predictor of intention or behavior once other variables were added to the model these results provide further support for criticisms of interventions that have targeted food safety through knowledge based interventions. The results provide further support for the utility of the TPB in predicting safe food handling. The addition of risk perception added to the predictive utility of the model, suggesting that researchers may want to incorporate that factor into future considerations of food hygiene using the TPB.

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## 1. Introduction

### 1.1. Food hygiene, the extent/prevalence of the problem

Approximately one in four Australians experience foodborne illness each year – with over 5.4 million cases of food poisoning estimated annually (Hall et al., 2005). This is consistent with data from the USA in 1999 (Mead et al., 1999), which estimated of 76 million cases, giving rates of just over one in four. Rates are lower in the UK, where it was estimated that there were 926,000 cases of foodborne disease in 2007 (Food Standards Agency, 2009). Furthermore, these figures are likely to underestimate the true incidence of foodborne disease due to under-reporting (Crerar, Dalton, Longbottom, & Kraa, 1996). The high incidence of foodborne illness has serious implications for public health (Hall & Kirk, 2005) and represents a significant financial burden including

ill-health, sick leave and death (Desmarchelier, 1996). For example, costs in Australia are approximately \$1.25 billion annually, including an average of 120 deaths a year (Food Authority NSW, 2008) and in the UK are approximately £1.5 billion annually (Food Standards Agency, 2005), including an average of 687 deaths per year (Adak, Meakins, Yip, Lopman, & O'Brien, 2005).

A large proportion of foodborne illness originates in the home (Ryan, Wall, Gilbert, Griffin, & Rowe, 1996), with research demonstrating that consumers do not implement safe food handling practices (Brennan, McCarthy, & Ritson, 2007; Jay, Comar, & Govenlock, 1999; Redmond & Griffith, 2003a). Further, childhood is an important time for developing knowledge and skills about food hygiene and preparation. However, teaching of these skills in schools appears to be declining. For example, teaching of food hygiene is not included in the national curriculum in England and Wales (Mullan, 2009). Very little attention has been given to children and adolescents' food handling practices, even though they prepare food regularly. For example, one study found that 95% of middle-school children helped to prepare food (Byrd-Bredbenner, Abbot, & Quick, 2010), whilst another found that 92% of middle school children prepared meals or snacks at home (Haapala & Probart, 2004). In addition, children and adolescents will become

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responsible for food shopping and preparation in the future (Byrd-Bredbenner et al., 2010). A study in the USA looking at middle school children (mean age 12) found that although students had a basic and fairly broad knowledge base related to safe food handling, they had limited comprehension as to why safe food handling is important and how to practice safe food handling (Byrd-Bredbenner et al., 2010). In order to improve food hygiene practices, particularly in adolescents, it is important to understand the underlying factors that contribute to behavior.

### 1.2. The role of knowledge

One explanation for poor food handling in the home is lack of knowledge. Increasing knowledge can allow the consumer to make more informed behavioral choices. Indeed, the majority of interventions to prevent foodborne illness have focused on education (Milton & Mullan, 2010), in the belief that failure to engage in food hygiene behavior is the result of inadequate food safety knowledge (Griffith, Worsfold, & Mitchell, 1998). Empirical studies provided mixed support for this interpretation. Some studies have found that knowledge is the most important predictor of compliance with safe food handling (Abbot, Byrd-Bredbenner, Schaffner, Bruhn, & Blacklock, 2009), and knowledge is limited in young adult populations (Giritlioglu, Batman, & Tetik, 2011; Osaili, Obeidat, Abu Jamous, & Bawadi, 2011). However, many studies have demonstrated a discrepancy between knowledge and food hygiene behavior (Clayton, Griffith, & Price, 2003; Harris & Mullan, 2009; Mullan, 2010; Soon, Baines, & Seaman, 2012). Research with children is limited. For example, one study which used children's assessment of their food hygiene knowledge found that although 97% of their sample of young adults rated their own food safety knowledge as at least fair, 60% did not wash their hands with soap and water after touching raw poultry (Byrd-Bredbenner, Maurer, Wheatley, Cottone, & Clancy, 2007). One study that measured actual food hygiene knowledge suggested that food safety knowledge in middle school children was only moderate, and that there was a disconnect between knowledge and behavior (Haapala & Probart, 2004). Therefore other variables that may also contribute to predicting and changing safe food handling practices must be investigated. In addition, other variables may interact with knowledge to better predict food hygiene behaviors.

### 1.3. The role of other variables in explaining food hygiene

Thus most research concludes that while knowledge is an important element in food hygiene, knowledge alone does not lead to safe food handling behavior (Harris & Mullan, 2009; Mullan, 2010). Social cognition models from the realm of health psychology have been frequently posited as an important tool in improving both prediction and intervention research in safe food handling (Griffith, Mullan, & Price, 1995; Mullan, 2010; Rennie, 1995). One such model is the health belief model (Rosenstock, 1974); which considers barriers and benefits of engaging in safe food handling as well as how severe food poisoning is seen to be and the degree of susceptibility to the illness. Within the arena of food hygiene some studies have found this model to be useful with older adults (Hanson & Benedict, 2002) but not with younger adults (McArthur, Holbert, & Forsythe, 2006). There has also been more general criticism of the model in the wider health arena. For example a meta-analysis of the model (Harrison, Mullen, & Green, 1992) concluded that there were weak effect sizes and poor homogeneity of the variables within studies. A later meta-analysis suggested that due to the weakness of two of the predictors, the health belief model as it is currently conceived should not be used (Mente, de Koning, Shannon, & Anand, 2009).

Another more frequently applied social cognition model is the theory of planned behavior (TPB; Ajzen, 1991). The theory of planned behavior posits that the most important determinant of behavior is intention, whereas intention in turn, is predicated by attitude, subjective norm and perceived behavioral control (PBC; Ajzen, 1991). Attitude is a measure of the degree to which a person has a favorable or unfavorable evaluation toward the behavior, such that when a person thinks that preparing and handling food hygienically is important and necessary, they are more likely to intend to engage in behavior. Subjective norm represents the normative influences or the perceived social pressure to perform or not perform the behavior. In the case of food hygiene, if an individual believes that important people such as parents or friends think that food hygiene behaviors are important, they are more likely to intend to perform these behaviors. Finally PBC represents the individual's perceptions of the ease or difficulty of performing the behavior of interest. Thus, if a person has the necessary materials to prepare food hygienically, and finds the behavior easy, they are more likely to have strong intentions to perform the behavior. PBC can influence both intentions and behavior, in that when a behavior is under not under volitional control PBC can directly affect behavior.

A number of studies have looked at safe food handling using the TPB. For example, Clayton et al. (2003) found that the TPB explained 34% of the variance in hand hygiene malpractices in the workplace, and Seaman and Eves (2010) found the model successfully predicted food safety practices in small food businesses. Clayton and Griffith (2008) used social cognition models to predict safe hand washing, and found the TPB was the most appropriate model. Mullan and Wong (2009) applied the theory to the prediction of consumer food handling practices in a population of Australian young adults. That study found that the TPB constructs predicted 66% of the variance in intention and 21% of the variance in behavior. More recently, a study investigating prediction of intentions to adopt safe home food handling practices including hand washing and food thermometer use (Shapiro, Porticella, Jiang, & Gravani, 2011). The TPB explained 42% of the variance in intention to wash hands and 43% of the variance in intention to use food thermometers. PBC was the most significant predictor of intentions. Few studies have considered children within this theoretical framework. However, a series of studies by Mullan (Mullan, 1998, 2009) have indicated that intention is a significant predictor of children's safe food handling behaviors. Together these studies clearly show that the TPB can be successfully applied to the prediction of food hygiene behaviors.

Although the TPB has shown relative success in predicting food hygiene practices, it has some limitations that need to be considered. Firstly, the current body of literature does not discern whether the TPB variables can predict intention and behavior over and above knowledge. It has been argued that knowledge alone is not sufficient for behavior to be performed but whether it can or should be incorporated into existing models of health behavior has not been explored in detail. Fishbein and Ajzen (2010) argue that there are only at best modest correlations between knowledge and behavior. However, in the case of food hygiene, knowledge importantly pertains to how to perform behaviors correctly (e.g. you should not cut meat and vegetables on the same chopping board), rather than general knowledge that may be related to other health behaviors (e.g. what proportion of breast cancer occurs in women over 50). Therefore, knowledge in this particular behavior may be more important in actually performing behaviors correctly to reduce the risk of foodborne illness.

Secondly, there is usually a large proportion of variance unaccounted for in both intentions and behavior. Consequently, the TPB is open to the inclusion of additional variables that may increase

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