Chronic diseases are increasing in prevalence across the world, accounting for 60% of deaths (Tunstall-Pedoe, 2006). They are also responsible for the majority of healthcare budget expenditures (Centers for Disease Control and Prevention, 2014). Many chronic diseases are strongly influenced by behaviours of individuals, and several of these behaviours can be prevented or modified during childhood (Halfon and Hochstein, 2002; Tunstall-Pedoe, 2006; Van Cleave J, Gortmaker SL, & Perrin JM, 2010), including tobacco use and exposure, inadequate dental care, and poor nutrition (Office of Disease Prevention and Health Promotion, 2014). In the United States, national surveys report that 17% of children live with a smoker in the house (Centers for Disease Control and Prevention, 2010), 55% do not have regular contact with a dental health provider (Edelstein and Chinn, 2009; Griffin et al., 2014), and 60-70% consume sugar-sweetened beverages (SSBs) daily (Ogden, Kit, Carroll, & Park, 2012).

Tobacco-smoke exposure is a main driver of several adverse health outcomes in paediatrics including sudden infant death syndrome, asthma,
dental caries, and upper and lower respiratory tract infections (U.S. Department of Health and Human Services, 2014). Early childhood dental caries is the most prevalent chronic disease of childhood and a major cause of morbidity and out-of-pocket costs for families (Casamassimo, Thakkurissy, Edelstein, & Maiorini, 2009; Edelstein and Chinn, 2009; Scully, 2000). Regular contact with a dental provider has been shown to reduce unscheduled appointments and hospitalizations for dental issues (Sen et al., 2013). Finally, excessive consumption of SSBs is one of the main drivers of the epidemic of paediatric obesity and contributes to poor dental health (DeBoer, Scharf, & Demmer, 2013; Evans et al., 2013; Malik, Pan, Willett, & Hu, 2013).

Social norms have been shown to influence health-related behaviours and can be divided in two categories: injunctive norms and descriptive norms. Injunctive norms represent our belief of what others think we should do and are present in many behaviour change models, including the theory of planned behaviour (Montano and Kasprzyk, 2015). Conversely, descriptive norms are individuals’ perceptions of the behaviours of others (Wiium, Torsheim, & Wold, 2006). Descriptive norms, the subject of this article and hereafter referred to simply as “social norms”, predict many behaviours, including physical activity, fruit and vegetable consumption, screen time, and smoking in both adults (Smith-McLallen and Fishbein, 2008; Wiium, et al., 2006) and adolescents (Lehto et al., 2016; Pedersen, Gronhoj, & Thogersen, 2015; Stok, de Ridder, de Vet, & de Wit, 2014). Because social norms are based on perceptions as well as incomplete information, they can sometimes be erroneous and normalize harmful behaviours (Lally, Bartle, & Wardle, 2011; Lally et al., 2012). For example, teenagers and young adults tend to overestimate the alcohol consumption of their peers and underestimate others’ consumption of fruit and vegetables (Foxcroft, Moreira, Almeida Santimano, & Smith, 2015; Lavinghouze et al., 2015; Stok, et al., 2014). Importantly, interventions based on the use of social norms have proven successful in a range of behaviours, including alcohol use and healthy food consumption (Sharps and Robinson, 2016; Steers et al., 2016; Stok, et al., 2014; Thorndike, Riis, & Levy, 2016).

To date, few studies have investigated parental social norms as a potential target for interventions to improve health outcomes in children. Some early studies evaluating social norms for snacking, booster seat usage, and tooth brushing have been promising (Jeffrey, Whelan, Pirouz, & Snowden, 2016; Lally, et al., 2012; Trubey, Moore, & Chestnutt, 2015). In this study, we aimed to determine parents’ perceived prevalence (“social norms”) of three health-related behaviours (tobacco-smoke exposure, dental care visits, and consumption of SSBs) among other families in their neighbourhoods. We tested if the social norms of parents who reported a risk factor (e.g., a smoker in the house) were different than parents who did not report the risk factor (e.g., no smoker in the house). Finally, we sought to determine whether parents who reported a risk factor were more likely to report intention to change the behaviour (e.g., quit smoking) if they had a low perceived prevalence of the risk factor, compared to those who had a high perceived prevalence of the risk factor.

Materials and Methods

Study design

This study used baseline cross-sectional data from a study on the use of pre-appointment screening for risk factors in the paediatric office waiting room (Drouin and Winickoff, 2018). Relevant components of the study are summarized below.

Population

We recruited parents or legal guardians of children aged 0-18 years old who attended one of two academic general paediatric practices. From October 2016 to January 2017, during clinic opening hours Monday through Friday, two research staff approached all eligible parents after the clinical encounter. To be eligible, parents needed to be at the clinic for a scheduled appointment with their child’s regular primary care physician and speak English. Participants were excluded if they were not the parent or the legal guardian of a child 0-18 years old. Parents who came to the clinic more than once during the study period were only eligible to participate on one occasion.

Procedure

Research staff approached parents in the waiting room after the medical appointment was completed. After describing the study, screening for eligibility, and obtaining written informed consent, research staff conducted a 10-minute
verbal survey, with data entered by the research staff on an electronic tablet. Participants received a $5 gift card for their participation. Study data were collected and managed using REDCap electronic data capture tools. (Harris et al., 2009). Data were de-identified and stored on a password-protected server hosted at the Massachusetts General Hospital. The authors were the only people with access to the data. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies.

**Exposure**
A child was considered to be “at risk” for smoking if the parent reported that there was a smoker in the house. National guidelines recommend that children visit the dentist by 12 months or after first tooth eruption (American Academy of Pediatrics, 2013). Consequently, a child ≥2 years was considered “at risk” for undiagnosed dental caries if he or she had not seen a dentist in the previous 6 months. Finally, guidelines recommend limiting beverages high in sugar. Therefore, if the child was 12 months or older, he or she was considered “at risk” for obesity and related chronic diseases if he or she consumed SSB once a day or more (American Academy of Pediatrics, 2013). SSB consumption was obtained by asking participants three separate questions about their child’s consumption of “regular soda or pop that contains sugar”, “fruit juice”, and “sweetened drinks such as Kool-Aid, lemonade, sweet tea, Hi-C, cranberry juice cocktail, sport drinks, etc” (Taveras et al., 2015).

**Outcomes**
The primary outcome was the parent-reported social norm (estimated neighbourhood prevalence) for each risk factor. After being asked about the presence of risk factors, parents were asked: “Among children the same age as your child and living in your neighbourhood, how many do you think [live in a house with smoker/go to a dentist twice a year/drink SSB at least once a day]?” For each social norm question, parents were given the following response choices “No children,” “1 out of 10 children,” “2 out of 10 children,” and up until “all children.”

A secondary outcome was intention to change the risky behaviour in the next 30 days. For example, parents of children who drank SSBs once a day or more were asked to respond “yes” or “no” to the statement: “At some point in the next thirty days, I intend to decrease the quantity of juice or soda/pop my child drinks” (Billich et al., 2018; Jung, 2016). For children exposed to tobacco smoke, this question was only asked of those participants who were the smoker. Other covariates measured included ages of the parent and the child, race/ethnicity, education, insurance status, and difficulty in making ends meet (Council On Community, 2016). All outcomes were obtained by parental self-report.

**Analysis plan/Statistical methods**
We performed t-tests to compare social norms between the parents in the “at risk” group and those in the “not at risk” group for each risk factor. We used multivariate linear regression models to adjust for socio-demographics characteristics and report the difference in perceived prevalence between the two groups, along with the 95% confidence interval. For all analyses, we used the standard threshold of p<0.05 for statistical significance. To evaluate the impact of social norms on behaviour change intention among participants in the “at risk” group, we used multivariate logistic regression models using behaviour change intention as the outcome, and social norm as the predictor of interest for each risk factor. We also adjusted for socio-demographic variables in those models. All statistical analyses were performed using SAS 9.4 (Cary, NC). This research study was approved by the Partners Institutional Review Board on June 5, 2016 and the main study from which this data was generated is registered at clinicaltrials.gov (NCT02912000).

**Results**
A total of 1174 parents were approached to participate in the study; 526 (44.8%) did not meet inclusion criteria, and 648 (55.2%) participants were included in this study. Among those who did not meet inclusion criteria, 288 (54.8%) were excluded because they were not seeing their regular physician, 141 (26.8%) had previously been approached for the same study at an earlier time, and 52 (9.9%) were excluded due to their inability to answer the survey in English. Demographic characteristics of the sample can be found in Table 1. Mean age (SD) of the parents and children were 37.6 (7.8) and 4.5.
Table 1
Children, and parents’ characteristics in the sample, and among those “at risk” for each risk factor

<table>
<thead>
<tr>
<th></th>
<th>Smoker in the house</th>
<th>Child ≥2 years who has not seen dentist in 6 mo&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Child ≥12 months who drinks ≥ 1 SSB a day&lt;sup&gt;c&lt;/sup&gt;</th>
<th>No risk factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=53/648</td>
<td>n=77/341</td>
<td>n=151/435</td>
<td>n=425</td>
</tr>
<tr>
<td><strong>Child’s characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age, mean (SD), y</td>
<td>6.1 (5.3)</td>
<td>5.9 (4.9)</td>
<td>7.8 (4.9)</td>
<td>3.2 (4.8)</td>
</tr>
<tr>
<td>% ≥ 12 months</td>
<td>41 (77)</td>
<td>77 (100)</td>
<td>151 (100)</td>
<td>224 (53)</td>
</tr>
<tr>
<td><strong>Parent’s characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent age, mean (SD), y</td>
<td>38.0 (11.3)</td>
<td>36.0 (6.4)</td>
<td>39.4 (8.9)</td>
<td>37.0 (7.0)</td>
</tr>
<tr>
<td>Female</td>
<td>47 (89)</td>
<td>64 (83)</td>
<td>123 (81)</td>
<td>326 (77)</td>
</tr>
<tr>
<td>College graduate</td>
<td>11 (21)</td>
<td>48 (64)</td>
<td>63 (43)</td>
<td>330 (81)</td>
</tr>
<tr>
<td>Self-reported &quot;race&quot;/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black/African American</td>
<td>10 (19)</td>
<td>9 (13)</td>
<td>30 (23)</td>
<td>44 (11)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>4 (8)</td>
<td>6 (9)</td>
<td>14 (11)</td>
<td>34 (9)</td>
</tr>
<tr>
<td>White</td>
<td>33 (62)</td>
<td>34 (49)</td>
<td>63 (47)</td>
<td>250 (64)</td>
</tr>
<tr>
<td>Other</td>
<td>6 (11)</td>
<td>21 (30)</td>
<td>26 (20)</td>
<td>63 (16)</td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>35 (48)</td>
<td>15 (20)</td>
<td>51 (35)</td>
<td>51 (13)</td>
</tr>
<tr>
<td>Private</td>
<td>26 (50)</td>
<td>57 (75)</td>
<td>87 (60)</td>
<td>344 (85)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>4 (5)</td>
<td>7 (5)</td>
<td>11 (3)</td>
</tr>
<tr>
<td>Have difficulty making ends meet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19 (37)</td>
<td>14 (19)</td>
<td>35 (24)</td>
<td>26 (6)</td>
</tr>
<tr>
<td><strong>Risk factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker in the house</td>
<td>53 (100)</td>
<td>8 (10)</td>
<td>26 (17)</td>
<td>0</td>
</tr>
<tr>
<td>Participant is the smoker</td>
<td>31 (58)</td>
<td>5 (6)</td>
<td>16 (10)</td>
<td>0</td>
</tr>
<tr>
<td>Child has not seen a dentist in last 6 months&lt;sup&gt;c&lt;/sup&gt;</td>
<td>8 (22)</td>
<td>77 (100)</td>
<td>30 (22)</td>
<td>0</td>
</tr>
<tr>
<td>Child drinking SSBs ≥1x/day (incl. juice)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>26 (63)</td>
<td>47 (39)</td>
<td>151 (100)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Intent to change risk factor in next 30 days&lt;sup&gt;d&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention to change</td>
<td>14 (47)</td>
<td>50 (67)</td>
<td>76 (55)</td>
<td>NA</td>
</tr>
<tr>
<td>No intention to change</td>
<td>16 (53)</td>
<td>23 (33)</td>
<td>62 (45)</td>
<td>NA</td>
</tr>
</tbody>
</table>

a) Unless indicated, data are expressed as number (percentage) of patients. Percentages have been rounded and may not sum to 100.
b) Among 341 children ≥2 years
c) Among 435 children ≥12 months
d) For smoking, this question was only asked to participants who were smoker themselves
NA: Not applicable
Participants whose children were exposed to tobacco (“at risk” group) reported higher social norms (perceived neighbourhood prevalence) of tobacco-smoke exposure compared to participants whose children were not exposed to tobacco smoke at home (“not at risk” group) (40.8% vs. 19.2%, P<0.001) (Figure 1). Parents of children in the “at risk” group, compared to parents in the “not at risk” group reported higher prevalence of not seeing a dentist in the last 6 months (50.5% vs. 24.7%, P<0.001) and consuming SSB (74.7% vs. 54.4%, P<0.001) (Figure 1).

In multivariate models, after adjusting for socio-demographic characteristics, parents with children at risk for tobacco believed that the neighbourhood prevalence of tobacco smoke exposure was 12.2% [95% C.I. 5.8%; 18.6%] higher than parents of children who were not at risk for tobacco (Table 2). Similarly, parents of children who had not seen a dentist in the previous six months believed the prevalence of the risk factor was 18.6% higher [95% C.I: 10.7%; 26.5%] than parents of children who were not at risk. And parents of children with frequent SSB consumption believed the prevalence of the risk factor was 12.1% [95%C.I.: 5.1%; 19.0%] higher than parents whose children did not consume SSBs regularly (P<0.001 for all comparisons) (Table 2).

We conducted an exploratory analysis to determine whether the social norms among parents in the “at risk” group were associated with their intention to change the risk factor. Among parents in the “at risk” group, between 47% and 67% reported wanting to change the behavioural risk factor in the next 30 days (Table 1). There were no significant differences in social norms between parents who reported intention to change a behaviour when compared to those who reported
no intention to change: 44% vs. 42% (p=0.83) for tobacco smoke exposure, 49% vs. 54% (p=0.58) for dental visit, and 74% vs. 64% (p=0.09) for SSB consumption (Figure 2). The differences remained non-significant after adjusting for socio-demographic characteristics.

**Discussion and Conclusion**

This study found that parents with children exposed to three important childhood behavioural risk factors believed the risk factor was more prevalent in their community compared to parents with children who were not exposed to the risk factors. The differences remained non-significant after adjusting for socio-demographic characteristics.
factor. This finding was consistent for all behaviours examined: tobacco smoke exposure, dental visits, and SSB consumption. These results suggest that considering parents’ social norms about risky health behaviours may be an important strategy to help paediatric clinicians and healthcare administrators change these behaviours of children and their families.

It is possible that the parents in the “at risk” groups truly had higher neighbourhood prevalence of each risk factor than the parents in the “not at risk” groups. Households with a smoker were more likely to report Medicaid insurance and “having difficulty making ends meet.” Therefore, these families may have lived in low-income communities that had higher rates of smoking. Previous research has demonstrated that smoking does occur within social networks (Christakis and Fowler, 2007). In this study, we were not able to determine whether true differences in the prevalence of the risk factors or inaccurate parental perceptions explained our findings. Knowing that all three behavioural risk factors may cluster in low socio-economic populations, we adjusted for parent demographics in our analyses. Even after accounting for demographics, the differences remained statistically significant, suggesting that only part of the effect observed was due to the clustering of risk factors. The tobacco exposure social norms findings in our study are similar to a previously published report showing that college smokers tend to overestimate the prevalence of smoking among their peers (Terry and Terry, 2012).

Our results suggest that an intervention aimed at correcting potentially erroneous social norms beliefs of parents might be an effective strategy to create positive behaviour change among children exposed to modifiable risk behaviours. In a study to promote child booster seat usage, a brief intervention using descriptive norms to inform parents that a majority of other parents engage in the desirable behaviour (booster seat usage) was effective (Jeffrey, et al., 2016). This finding suggests, that these types of interventions could be integrated into either clinical encounters or public health messaging.

Study limitations
This study has limitations. First, behavioural risk factors in this study were collected by self-report in the context of a visit to the child’s physician. Therefore, parents may have altered their responses to be viewed favourably by the research staff. The lower prevalence of each risk factor in our sample, when compared to national estimates, suggest that this may have occurred. However, any misclassification should have biased our results toward the null hypothesis, given that parents of children at risk (reporting higher perceived prevalence) would have been wrongly categorized in the “not at risk” group and would have inflated the mean perceived prevalence for that group. Second, we cannot know which population a parent was thinking about when describing the social norms. For example, some parents might have considered families living on the same street whereas other parents might have considered the entire town or city. We purposefully chose to ask about “children the same age as your child and living in your neighbourhood” because previous studies have shown that social norms are more accurate and more personally relevant when they refer to people with whom one can identify (as opposed to the general population) (Kahneman, 2011; Larimer et al., 2011). Unfortunately, we did not have access to “true” prevalence of those risk factors with the level of granularity required to make proper adjustment.

Conclusion
Parents of children exposed to three behavioural risk factors were more likely to believe that other children were exposed to the same risk factors than parents with children who were not exposed to risk factors. Correcting potentially false social normative beliefs could be an effective strategy to promote behaviour change among families with children at risk for unhealthy behaviours.

Funding and Acknowledgement
Financial support for this study was provided in part by a Professional Postgraduate Training in Research (Fellowship) Training Award, from the Fonds de recherche du Québec – Santé (O.D.), and by a Bright Futures Young Investigator Award from the Academic Pediatrics Association and funded by the Health Resources and Services Administration/Maternal and Child Health Bureau (MCHB) in cooperation with the American Academy of Pediatrics (Federal Grant U04MC07853-03) (O.D.). The project was also funded by the Flight Attendant Medical Research
Institute through a grant to the American Academy of Pediatrics Julius B. Richmond Center (New Investigator Grant to O.D. and grant number 052302, to J.P.W.). The funding agreement ensured the authors’ independence in designing the study, interpreting the data, writing, and publishing the report. The information, views, and opinions contained herein are those of the authors and do not necessarily reflect the views and opinions of these organizations.

The authors would like to acknowledge support from the Harvard-wide Pediatric Health Services Research Fellowship. A portion of the results has been presented as a platform presentation at the Pediatric Academic Societies 2017 Meeting.

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