ABSTRACT
Concern over climate change, traffic congestion, and the health consequences of sedentary living has led to a surge of interest in cycling as an efficient form for urban transportation. The link between cycling and improving safety for current cyclists and attracting future users needs to be made in order to attract future users and attract future areas, methodologies need to be developed to objectively determine how to optimally locate these facilities. This paper describes a method of using several data sources in a geographic information system (GIS) environment to identify optimal locations of new facilities. The methodology described here involves modeling: 1) current cycling facilities and travel behavior using the Origin-Destination (O-D) survey; 2) routes suggested by cyclists; and 3) routes based on the O-D survey. The first two measures can be used in identifying the high priority areas to build new cycling infrastructure or upgrade the existing infrastructure in the Montreal region to help in increasing the number of cyclists and improving the safety conditions for existing cyclists. Accordingly several measures can be used in identifying high priority areas in a region where new infrastructure will benefit existing and potential users. The first measure used in prioritizing areas to build new cycling infrastructure or upgrade the existing infrastructure is through an analysis of the travel behavior of the existing cyclists in the region. Identifying areas with high cycling activities can be achieved through an analysis of origin-destination surveys (O-D). The shortest estimated travel path between origins and destinations can be modified to identify parts of the region where high numbers of cycling trips occur. However, this method addresses existing demand only, limiting benefits to areas with presently high levels of cycling, while leaving the areas with lower levels unequipped with cycling facilities. Identifying areas where cycling can replace existing short distance car trips is the second measure we choose to use. This measure is directed towards potential cyclists. The first step is to identify trips by cyclists who commute to work destinations using the O-D survey. Second is to identify short motorized trips that fall under a certain distance threshold. The areas with high number of short motorized trips may indicate where new cycling infrastructure can attract new cyclists. Cyclists’ opinions, expressed in surveys, may also be usefully employed in locating new facilities. An online survey involving over 2000 respondents was conducted by the research team in the summer of 2009. This tool reveals current demand for new facilities, but benefits from the “sea and ground” experience of cyclists.

ANALYSIS & RECOMMENDATIONS
Safety is one of the most important decisions affecting cycling behavior and the perception of unsafe cycling conditions deters some people from commuting by bicycle. An indication of safety levels can be found in incident data, which are generally available through archived police reports. This data can be used to identify the identification of priority areas where interventions would likely be necessary. It should be noted that this method for identifying areas of intervention does not account for exposure, which is not available in many cases. Figure 3 shows each of the four data sources after being intersected with the 300-meter grid cells and normalized by the number of observation of each data source. Figure 3 shows the results when the above four data sources are combined into one variable and normalized. Identification of areas identified could be considered as priority zones, where future interventions in cycling safety will improve both the greatest number of cyclists and potential cyclists.

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FIGURE 3. Four data sources combined

A simple visual analysis of the combined methodology reveals that cycling facilities could be increased in central areas, where nearby facilities exist. Also, select routes from residential suburbs could help to increase cycling in peripheral areas if cycling conditions can be improved. This can take into account current cycling facilities with an aim to provide new cycling corridors. Cycling facilities in high value grid cells are not necessarily required. Solutions could include new facilities or parallel facilities. Table 1 details the facilities that could be built in these areas. The cycling network and cycling facilities will be improved by building new facilities or upgrading the existing facilities.