**Appendix 1**

**Interrupted Time Series Analysis (ITSA)**

Traditional methods assess the impact of policy change using mean values of the preintervention data and compare that with mean values of the postintervention data without considering the pre- and postintervention trends. Therefore, it is difficult to clearly attribute observed changes to a specific intervention. *Itsa* is a valuable statistical method to understand and visualize changes over time.

 *Itsa* has the ability to limit confounding factors that threaten the validity of effect estimates. Inherently, the design of an *itsa* makes it difficult for significant confounding, since a confounder would need to occur at approximately the same time as the study intervention to produce an effect simultaneously. Standard assumptions for *itsa* are that the trend is linear and would continue in perpetuity. Itproduces Newey-West standard errors for coefficients (newey), estimated by the ordinary least square regression (OLS). *Itsa* has strong internal validity, even in the absence of a comparison group, primarily because of its control over the effects of regression to the mean. Additionally, it has strong external validity when the unit of measure is at the population level.1

The **standard ITSA regression model** is represented by:

**Yt =** $β$**0 +** $β$**1Tt +** $β$**2Xt +** $β$**3XtTt +** $ϵ$**t**

where,

Yt is the aggregated outcome variable measured at each equally spaced time-point t,

Tt is the time since the start of the study

Xt is a dummy (indicator) variable representing the intervention (pre-intervention periods 0, otherwise 1), and XtTt is an interaction term.

$β$0 represents the intercept/ or starting level of the outcome variable.

$β$1 is the slope, or trajectory of the outcome variable until the introduction of the intervention.

$β$2 represents the change in the level of the outcome that occurs in the period immediately following the introduction of the intervention (compared to the counterfactual). Thus, we look for significant P-values in $β$2 to indicate an immediate treatment effect

$β$3 represents the difference between pre- and post-intervention slopes of the outcome. Thus, we look for significant P-values in $β$ 3 to indicate a treatment effect over time.

In the ITSA model for a single group (in this case, females living in Calgary) exposed to two sequentially administered policy interventions, there are five measures of interest: the trends in each of the three periods (preintervention and the two intervention periods) and the differences between each period’s trends (preintervention versus the first intervention, first intervention versus the second intervention). 1

**Yt =** $β$**0 +** $β$**1Tt +** $β$**2X1t +** $β$**3X1tT1t +** $β$**4X2t +** $β$**5X2tT2t** **+** $ϵ$**t**

$$where, $$

$β$0 is the interceptor starting level of the outcome variable.

$β$1 is the preintervention trend

$β$2 represent the first intervention trend$. $

$β$3 the difference between the preintervention trend and the first-intervention trend,

$β$4, represents the change in the level of the outcome that occurs in the period immediately following the introduction of the second intervention, and

$β$5 represents the difference in the level (intercept) of the outcome variable between the first and second intervention trends.

In this paper, X2t and X2tT2t are the variables representing the second intervention period in the study. (Canadian Task Force 2013 guidelines on cervical cancer screening). The two remaining measures of interest that require calculation are the first-intervention period trend, β1 + β3 and the second-intervention period trend, β1 + β3 + β5. 2

References:

1. Linden A. Conducting interrupted time-series analysis for single- and multiple-group comparisons. *Stata J*. 2015. doi:The Stata Journal

2. Linden A. A comprehensive set of postestimation measures to enrich interrupted time-series analysis. *Stata J*. 2017. doi:The Stata Journal