**SUPPLEMENTARY MATERIAL**

**1. Recurrent Time-to-Event Models**

The AG-CP, PWP-TT, and PWP-GT are referred to as extended Cox models as they are based on the Cox proportional hazards model and extended to account for recurrent events [25, 26]. Cox models are referred to as semi-parametric as they do not make assumptions on the distribution of time-to-event but estimate hazards based only on the observed data. The AG-CP model uses a counting process assuming all episodes are independent and equivalent with time to each measured from the first event. It uses a single baseline hazard as all events are measured from the same start time. It is the simplest recurrent time-to-event model. The PWP-TT and PWP-GT models are based on stratification (ordering) of events where a person is only at risk of a SA in the present stratum if they have had a SA in the previous stratum. Each stratum has its own baseline hazard. The PWP-TT model evaluates the effect of a covariate for the kth SA since the time of first observation (SA event), hence “total time”. The “gap-time” version, PWP-GT, evaluates the effect of a covariate for the kth SA since the k-1th SA effectively resetting the clock after each SA [25, 26]. The extended Cox models do not explicitly account for the correlated nature of event times due to multiple events occurring in the same individual. In these models, a variance-correction method called the sandwich robust standard error is used to adjust for the correlation [44].

The Shared Frailty, Mixed Effects, and Cox Shared Frailty models are “shared frailty” models that introduce an individual level random covariate into the model to explain variation in risk between individuals that cannot be explained by the observed covariates [25, 45]. It has been suggested that shared frailty models are better than variance corrected models for dealing with individual level correlation but do not address bias induced by event dependence. It has been recommended that a combination of shared frailty models and stratification based variance-corrected models be used to account for both the unobserved between-individual heterogeneity and within-individual event dependence [27]. In practice, authors investigating time-to-recurrent events usually report results from a number of different models [26, 27].

The Shared Frailty and Mixed Effects models are parametric models in that the hazard function and the frailty are assumed to take particular distributions. In this study, we used the Weibull proportional hazards distribution to model the hazard function and the gamma or normal distributions to model the frailties. Weibull and gamma were initial choices as they are commonly used in similar clinical settings [26, 27] and noted options in technical reports [46].

The normal distribution for frailties was used for the Mixed Effects model [46]. The Shared Frailty and Mixed Effects models are essentially the same except that the Shared Frailty model is a generalization of a survival regression model while the Mixed Effects model is based on a multilevel mixed effects approach to survival modelling. The Cox Shared frailty model is a semi-parametric (Cox proportional hazards) version of a shared frailty model and uses a gamma distribution for the frailty [25, 28].

**2. Truncation Points**

Models were built and tested using the complete data set and when the number of SA presentations was truncated at 20, 15, 10, and 5. In terms of influence at the chosen truncation points; at 20 presentations, the most frequently presenting 1.7% of the group contributed 22.5% of all presentations. At 15, 2.0% of the group contributed 24.3% of the presentations, at 10, 2.7% of the group contributed 27.2% of the presentations, and at 5, 10% of the group contributed 45.5% of the presentations. At all truncation points, SPP, >1st SA, Age, Personality Disorder, and being Indigenous were seen to predict time to SA re-presentation under each model (though the P-values for Age and Indigenous status varied around significance, 0.05, depending on model, see Table 3 and Figure 2). Using the complete dataset, an interaction between SPP and >1st SA was also significantly (HR=1.6, P=0.036) associated with an increased time to SA. That is, there was a differentially greater increase in time to SA re-presentation if the person was put on the SPP after their first SA presentation rather than a subsequent presentation. The effect was similar but non-significant (P>0.05) in each of the truncated datasets (e.g. truncated at 5 presentations for the Shared Frailty model; HR=1.5, P=0.095, Fig. 3c).

**3. Interpretation of Models**

Six different recurrent time-to-event models were used in this study. The simplest model, the AG-CP, provided similar HR estimates and standard errors to the other models and has been described as “robust” when one is interested in the overall effect and, in particular, to a simulated confounder [26]. The assumption required for the AG-CP model however, that the whole sample is at risk for each repeat event, does not seem realistic. The more sophisticated PWP-TT and PWP-GT models were not suited to the current study as they could not explicitly express the effect of number of previous SA presentations as these used within stratum calculations (which inherently takes account of such an effect). The three shared frailty models were able to account for unmeasured, individual-specific heterogeneity that could not be explained by the covariates. In this study, the shared frailty models consistently identified younger Age as a significant predictor of SA re-presentation due to their ability to directly model individual correlation. Interestingly, in comparison to the extended Cox models, the shared frailty models over-estimated the effect of personality disorder but underestimated the effect of being indigenous. This may be related to the correlated nature of these variables and that the shared frailty models were better able to separate the relative effects due to incorporation of a random individual-level effect in the models.

We chose to use the Shared Frailty model as the primary model to represent the effects of SPP and other covariates (Fig. 3) as it was robust to changes in variables and truncation points and directly modeled the correlated nature of recurrent SA events. However, it should be noted that the Shared Frailty and Mixed Effects models are parametric and rely on the choice of well-fitting distributions for the hazard and frailty. If the sample is large, it has been suggested that the semiparametric Cox Shared Frailty model is preferable [47]. However, we found this model to take considerably longer computing time and others have noted that with increasingly complex models there are often problems with convergence [27].