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## The Meaning of “Intermittency” in Criminal Careers

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## The Meaning of “Intermittency” in Criminal Careers

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**Abstract**

Van Koppen, Rodermund, and Blokland recently published an article in this journal entitled “Waxing and waning: Periods of intermittency in criminal careers”. We are concerned that this article will cause confusion in criminal career research because they use the word “intermittency” to refer to time intervals between convictions. We are happy to recognise that their article contributes to knowledge about time intervals between convictions, but we believe that the term “intermittency” should refer to time intervals between two criminal careers when the underlying rate of offending – termed the underlying “criminal inclination” by Van Koppen et al. – is zero. In order to study intermittency, it is important to test probabilistic models of criminal careers. To the extent that there is intermittency, it is desirable to investigate why individuals stop offending, why they maintain a zero-rate of offending for some time, and why they restart offending. We believe that it is also important to study the possibility of waxing and waning in criminal careers, by testing whether the underlying rate of offending during the active criminal career stays constant or varies over time.

Van Koppen, Rodermund, and Blokland [9] recently published an article in this journal entitled “Waxing and waning: Periods of intermittency in criminal careers”. We are concerned that this article will cause confusion in criminal career research because they use the word “intermittency” to refer to time intervals between convictions. For example, in their first two pages, they define intermittency as “time gaps between subsequent offences”, and on page 7 they define intermittency as “the time period between two convictions”. We are happy to recognise that their article contributes to knowledge about time intervals between convictions, but we believe that the term “intermittency” should refer to time intervals between criminal careers when the underlying rate of offending – termed the underlying “criminal inclination” by Van Koppen et al. – is zero. For ease of exposition, we will call these intervals “zero-rate intervals”. (Van Koppen et al. actually study years in which convictions occur, rather than convictions. Again for ease of exposition, we will refer to these as “convictions” rather than “conviction-years”.)

According to the Oxford English dictionary, Webster’s Dictionary and the internet (e.g. Dictionary.com), the word “intermittency” refers to stopping for a time and then restarting. For example, consider a golfer who plays on average once a week, except during the three winter months when he does not play at all. During the period when he is active, there can be some variation in the time intervals between rounds: he might play two or more times in some weeks and not play in others. However, the three winter months constitute a true period of intermittency (a zero-rate time interval between stopping and restarting) and a genuine behaviour change, whereas a relatively long two-week interval between two successive rounds in May would not.

The opposite of “intermittent” is “continuous”. There will, of course, be time intervals between convictions in continuous criminal careers. For example, if two offences are committed one day apart, we do not think that it would be sensible to take this as evidence of “intermittency” in criminal careers.

A challenge in the analysis of criminal careers is how to distinguish relatively long intervals between convictions during an active continuous criminal career, when the underlying rate of offending is greater than zero, from genuine intermittency periods, when the underlying rate of offending is zero. A long interval between convictions, after all, might reflect not a cessation in criminal activity but rather unusually good luck in avoiding arrests. To distinguish intermittency from random within-career fluctuations, it is desirable to work with a probabilistic model. In this respect, the paper of Van Koppen et al. [9] falls short.

Such a probabilistic model of criminal careers was offered in the landmark report of the National Academy of Sciences Panel on Criminal Career Research. Blumstein et al. [3] proposed a very simple model of criminal careers, focusing on the underlying rate of offending. This rate was termed “lambda”, because the simplest assumption was that offences occurred at random at some mean rate over time, thereby following a Poisson distribution with a mean of lambda. In this simple model, offending begins at a particular age (i.e. lambda changes from zero to greater than zero), continues at a stable rate of lambda, and then terminates at a particular age (i.e. lambda changes from greater than zero to zero).

We [1] showed that conviction careers from age 10 up to the twenty-fifth birthday in the Cambridge Study in Delinquent Development (see e.g. [4]) could be fitted very well by assuming that there were two categories of recidivist offenders: “frequents” (43%), with an average conviction rate of 1.14 convictions per year and a probability of termination after each conviction of .10; and “occasionals” (the other 57%), with a lower mean conviction rate of .41 convictions per year and a probability of termination of .33 after each conviction. Our research was limited by small numbers (only 136 offenders) but our types of models were largely validated by MacLeod et al. [7] with much larger samples; for a review of these and other criminal career models, see Farrington et al. [5].

We [2] then investigated the extent to which our model could predict later conviction data between the twenty-fifth and thirtieth birthdays. Our aim was to predict the number of reoffenders, who would become reoffenders, the number of reconvictions, the age at the first reconviction, and time intervals between reconvictions, in this follow-up period. Figure 1 of our paper shows the probability that an offender is still active (i.e. has a non-zero lambda) at age 25 versus the age at his last previous conviction. For example, frequent offenders with a last conviction at age 20 had a probability very close to zero of still being active, whereas occasionals with a last conviction at age 20 had a probability of about 0.2. That probability reflects uncertainty about whether a five-year interval ending at age 25 was long enough to indicate a zero-rate interval, rather than just reflecting a long conviction-free period that might be expected because of their lower lambda value.

Generally, the model performed well, but more of the frequent offenders were reconvicted than expected, and they had more reconvictions than expected. The predictions for occasionals were excellent. For example, overall, the model predicted that 29% of all offenders would be reconvicted, and the actual percentage was 33%. For occasionals, the predicted percentage was 29% and the actual percentage was 31%; for frequent offenders, the predicted percentage was 28% but the actual percentage was 36%. We found that these results could be explained by reference to the behaviour of the 16 frequent offenders with extremely low probabilities of reconviction (less than .10 each). Five of them actually became recidivists, compared with the model prediction of 0.31.

These five men had their first conviction at age 16.4 on average, had 5.8 convictions, then had their last conviction at age 19.4 on average. However, after a period of 7-10 years with no convictions, they were all reconvicted at the average age of 27.3, and three of them had a second reconviction at the average age of 29.4. We concluded that these five men began and ended one criminal career in their late teens and then restarted their criminal activities in their late twenties (possibly because of life changes

such as losing a job or separating from a spouse). We therefore identified a period of “intermittency” in offending (when  $\lambda$  was zero) and we referred to these men as “intermittent” offenders.

Returning to Van Koppen et al. [9], the aggregate data that they present does not allow the specification of a probabilistic model that reflects the career dynamics within the population studied. However, it is possible to make some general observations. For example, Van Koppen et al. report that the average time interval between convictions (which they inappropriately term “mean intermittency”) was 2.9 years. This corresponds to  $\lambda = .345$  convictions per year. They also report that the average number of convictions was 8.4, and the average maximum time interval between convictions was 8.4 years. Based on a very simple Poisson model, assuming a constant  $\lambda = .345$  for all offenders, for those with a continuous active criminal career of 9 convictions, the longest of the eight time intervals between convictions during the career would average 7.9 years. In other words, their observed longest interval is not very different from that which would be expected on the basis of random variations in convictions over time. To cite the longest time interval between convictions as evidence of “intermittency” (i.e. a zero-rate interval) risks attaching great significance to what are essentially chance fluctuations during a criminal career.

In order to draw conclusions about “intermittency”, Van Koppen et al. should have tried to fit their criminal career data using a simple model of two categories of offenders, such as that proposed by Barnett et al. [1]; or the slightly more complex model (still assuming a constant  $\lambda$  over time) of MacLeod et al. [7], with three categories of offenders. Van Koppen et al. suggest that there is “waxing and waning” in criminal careers (which we take to mean variations in  $\lambda$  over time) but they did not test whether their data could be fitted by these types of constant- $\lambda$  models. For that reason, they



have not demonstrated that their interpretation of the data as “waxing and waning” is more defensible than the assumption that  $\lambda$  is constant during criminal careers.

Van Koppen et al. [9] assert that observed convictions reflect an underlying “criminal inclination” that varies over time. They should specify this model explicitly, estimate the parameters, and investigate how well it fits their data compared to the much simpler constant- $\lambda$  models. A very complex model that improves goodness-of-fit slightly is not necessarily preferable to a very simple model that fits the data adequately. Van Koppen et al. should also use their model to assess whether the underlying “criminal inclination” is zero or greater than zero during particularly long time intervals between convictions, and hence to see if they can identify periods of “intermittency” when the underlying “criminal inclination” is zero.

Commendably, Van Koppen et al. have analysed a very large sample of offenders, and they took account of deaths and incarceration periods. However, there are other limitations of their work. For example, they only know the number of years in which there were convictions, not the exact ages on offending (which can be different from ages on conviction because of time delays between offences and convictions). The main advantage of focussing on official criminal careers (as opposed to criminal careers according to self-reports: see Farrington et al. [6]) is that exact ages on offending are usually known.

A further limitation of the Van Koppen et al. analyses is that different individuals were evaluated over very different age ranges. Their sample of offenders was aged 12-65 in 1977, so they were aged 40-93 when they were followed up in 2005. Clearly, the number of people followed up from age 12 to age 90 will be much less than (and, because of age, period and cohort effects, quite possibly different from) those followed up from age 12 to age 40. It would be much better to identify a subsample who were all followed up from age 12 to age 60 (say), and to restrict the analysis to the 94% who were males (since

they did not address gender differences). In criminal career research, the persons studied in one age range should not be different from those studied in each other age range.

These limitations, however, pale into insignificance compared with our main argument, namely that Van Koppen et al. [9] have not studied “intermittency” in criminal careers, in the usually accepted meaning of the term. Their paper raises important questions about criminal careers, but confuses “intermittency” (i.e zero-rate intervals) with time intervals between convictions which occur naturally during a continuous criminal career. These two vastly-different concepts should be carefully distinguished in criminal career research.

We believe that it is important in future to study the possibility of intermittency in criminal careers, defined as zero-rate intervals between two non-zero-rate periods of offending. For example, Nagin and Land [8], correctly referring to intermittency, proposed and tested an interesting model of criminal careers including zero-rate and non-zero-rate time intervals. To the extent that there is intermittency, it is important to investigate why individuals stop offending, why they maintain a zero-rate existence for some time, and why they restart offending. We believe that it is also important to study the possibility of waxing and waning in criminal careers, or in other words periods when  $\lambda$  might vary, and factors that influence these variations. We encourage longitudinal researchers to try to address these topics in the future, using probabilistic models.

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