

**Title:**

**Effectiveness of Small Group Cognitive Behavioural Therapy for Anxiety and Depression in  
Ebola Treatment Centre Staff in Sierra Leone**

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## **Abstract**

**Background:** Following the 2014 Ebola outbreak, South London and Maudsley NHS Foundation Trust (SLAM) were commissioned to provide a “culturally appropriate, effective and sustainable” intervention to address the psychological needs of the Sierra Leonean Ebola Treatment Centre (ETC) staff.

**Aims:** The study evaluated the effectiveness of group Cognitive Behavioural Therapy (CBT) developed to treat anxiety, depression and functional impairment amongst a sample of former ETC staff in Sierra Leone. Group comparisons explored whether the effect of the intervention differed dependent on the facilitators that delivered it, as well as whether it differed between former staff of high- and low-risk ETC roles.

**Methods:** A sample of 253 former ETC staff attended the group CBT intervention comprised of eight sessions over six weeks. Outcome measures were administered upon entry and within two weeks after the intervention.

**Results:** At post-intervention, anxiety, depression and functional impairment significantly reduced. Reading ability (RA) was introduced as a covariate having impacted the outcomes. The intervention effect differed by facilitators delivering the sessions but not by ETC role risk. The implications of these results are discussed.

**Conclusions:** Group CBT is a promising psychological intervention for treating the anxiety, depression and functional impairment of former ETC staff in Sierra Leone. Furthermore, as part of a stepped-care approach, it may provide a model for psychological support for staff that have worked on the frontline during future epidemics.

**Keywords:** Ebola virus disease, CBT, Sierra Leone, Disaster Response, Anxiety and Depression

## **Introduction**

On March 24th 2014, an outbreak of the Ebola virus was reported by the Guinean Ministry of Health, alongside cases in the bordering countries of Liberia and Sierra Leone (WHO, 2014). Ebola Treatment Centres (ETCs) were quickly established in which local and international healthcare services worked collaboratively. In Sierra Leone, over 2,000 national citizens were employed across six ETCs funded by the UK government's Department of International Development (DfID) and ran by different Non-Governmental Organisations (NGOs).

Although resilience is common, there is considerable evidence that working in disaster healthcare settings such as these can elicit a range of psychological difficulties including anxiety, depression and post-traumatic stress disorder (PTSD) (Brooks et al., 2015; Fullerton et al., 2004). The work undertaken by staff in ETCs was often traumatic and care providers reported feeling ostracised, lonely and afraid (Greenberg et al., 2015; McMahon et al., 2016). In the UK, guided self-help cognitive behavioural therapy (CBT) is considered the first line approach for mild-moderate anxiety and depression (Clark, 2011). However the feasibility of CBT in Sierra Leone is unclear.

Only one high quality trial of CBT-based group intervention in Sierra Leone successfully tested the effects in war-affected youth (Betancourt et al., 2014). More broadly, a meta-analysis of 15 trials of CBT in various low-and middle-income (LMIC) countries found that treatment tended to reduce anxiety and depression scores with a large effect size (van't Hof et al., 2011). The guidance to use CBT for a multitude of mental health problems, including anxiety and depression, was extended to LMICs by the WHO Mental Health Gap Action Programme (mhGAP; WHO, 2010).

One key consideration within LMICs, such as Sierra Leone, is literacy level. In 2013, the youth literacy rate (age 15-24) was 57.02% and the adult literacy rate (age 25+) was 32.43% (UNESCO, 2013). CBT is a therapy, which has typically involved written material; therefore, adaptations are needed for clients with low literacy levels to ensure its effectiveness (Kuhajda et al, 2011).

This paper describes the third phase of a stepped-care intervention, which provided CBT in small groups to the most severely affected ETC staff who reached clinical thresholds for anxiety and depression. The overall intervention is described in detail elsewhere (Waterman et al., 2018) and Figure 1 illustrates its timeline. This study evaluates the effectiveness of the intervention on a range of clinical measures, whilst also considering differences in effect when controlling for literacy level, facilitator differences and level of risk of infection to Ebola as confounding variables.

## **Hypotheses**

(1) The intervention will be effective in reducing scores of anxiety, depression and associated functional impairment in former ETC staff (2) Level of literacy of attendees, even though adaptations were made to accommodate participants with varying levels of literacy, will impact on the effectiveness of the intervention (3) Participants who had worked in ETC roles, which put them at the highest risk of infection, will initially demonstrate higher levels of anxiety, depression and functional impairment compared to those who worked in lower risk roles due to feeling less safe and experiencing more traumatic events (Thormar et al, 2013; West et al, 2008).

## **Method**

### Participants

Following phase two, 253 former ETC staff with clinically significant symptoms of anxiety and depression were invited to attend the small group CBT programme. Participants provided consent for the collection of outcome data.

### Location

The six DfID funded ETCs were supported by six different international NGOs, listed below in the order they opened (DfID, 2014). All were 100-bed facilities excluding Kerry Town, which housed 62 beds. District populations were taken from the 2015 Sierra Leone census:

- A. Kerry Town, Western Rural District (District population: 442,951)
- B. Port Loko, Port Loko District (District population: 614,063)

- C. Goderich, Western Urban District (District population: 1,050,301)
- D. Hastings, Western Rural District (District population: 442,951)
- E. Makeni, Bombali District (District population: 606,183)
- F. Moyamba, Moyamba District (District population: 318,064)

The ETC's were built near urban areas where demand for them was projected to be highest (DfID, 2014). See figure 2 for a map of the six ETC locations.

ETC's (Moyamba, Port Loko and Makeni) shared facilitators for the delivery of the CBT groups as there were fewer participants in these areas and the facilitators travelled between the locations to deliver the groups.

### Facilitators

Each session was delivered by two Sierra Leonean former ETC staff 'facilitators' who had been trained for two weeks in CBT group delivery by two UK clinical psychologists from SLaM (see figure 1 for timeline). The facilitators had also previously received two weeks of training for the earlier phases of the intervention. All 12 of these facilitators received weekly telephone or skype based support and coaching from a UK based psychologist or psychotherapist trained in CBT.

### Intervention

A scoping exercise was conducted at the start of the project and the results helped inform the overall three-phased intervention (Waterman et al., 2018).

In phase 3, the focus this study, all participants took part in a six-week x 3-hour group CBT for depression and anxiety programme based on the low-intensity CBT interventions delivered in the UK. These groups were conducted when Sierra Leone had been announced Ebola free and most of the ETCs had been decommissioned. The participants had returned to their usual lives by this point but were still affected by their experiences. The sessions covered topics such as behavioural activation; reducing avoidance behaviours; identifying values and generating goals related to these;

ways to deal with unhelpful cognitions and thinking patterns; problem solving skills; and strategies to manage anxiety.

Every session was supplemented by a booklet, which was adapted for the Sierra Leonean context. There was an additional low-literacy version, including more diagrams and images to depict CBT concepts. During training, further changes were made to the booklets by request of the facilitators to enhance cultural appropriateness. These booklets were in English (the official written language of Sierra Leone) under the guidance of the facilitators. However, the groups were facilitated in local languages, particularly Krio, to enhance cultural adaptation.

### Risk of Infection

The participants were divided into groups for part of the analysis based on their exposure to risk of infection during their ETC work. The ‘high-risk’ group had worked in areas putting them at high-risk of Ebola infection, such as the suspected and confirmed cases wards or burial grounds. The ‘low-risk’ group included participants in lower infection risk ETC roles, for example, kitchen or security staff. The third group were participants whose risk we could not quantify, for example, ‘care givers’ (Ebola survivors given high-risk roles under the non-scientifically proven assumption of having virus immunity).

### Measures

Outcome measures were completed one-week pre-intervention (T1) and within two weeks post-intervention (T2):

*Anxiety:* To measure anxiety, the Generalised Anxiety Disorder 7-item (GAD7) was used. Participants responded to 7 items on a 0-3 scale, with potential total scores ranging 0-21. Within this range, the cut-off points of 5, 10 and 15 indicate mild, moderate and severe levels of anxiety (Spitzer et al, 2006).

*Depression:* To measure depression, the Patient Health Questionnaire-9 item (PHQ9) was used. For the 9-item measure, cut off values of 5, 10, 15, and 20 reflect mild, moderate, moderately severe and severe depression (Kroenke et al, 2001).

*Functional impairment:* To measure the degree of functional impairment attributable to anxiety and depression, the Work and Social Adjustment Scale (WSAS) was used. This scale comprises five items relating to domains of functioning. Scores over 20 indicate moderately severe psychopathology, and scores between 10 and 20 suggest significant functional impairment usually observed within subclinical populations (Mundt et al., 2002)

*Feedback Questionnaire:* To explore the participant's experiences of the intervention, a feedback questionnaire was designed. This included Likert scales to rate the following: understanding of material; amount of material; clarity of presentation; amount learned; usefulness; homework task completion; homework task difficulty; ability to manage symptoms; goals and recovery; and overall rating.

The measures were completed independently by most participants, although some were supported by the facilitators to complete them by reading them out loud or explaining terms if required. The data was recorded without a name and identified only by a telephone number and demographic factors. When the data was analysed, a number of duplications in phone number were found, although the corresponding cases had varying demographic information, suggesting a different person. We expect that some participants used the phone numbers of friends or family when they did not know their own. This occurred in 37% of cases. Therefore, all cases required matching on at least two demographic factors to ensure reliability.

### Statistical analysis

For analysis, the groups within Moyamba, Makeni and Port Loko, which were all delivered in rural locations and shared the same facilitators, were grouped together.

Preliminary analyses at pre-intervention indicated that reading ability (RA) negatively correlated with GAD-7 ( $r = -.236, p = .036$ ), PHQ-9 ( $r = -.233, p = .040$ ), WASAS ( $r = -.116, p = .024$ )

total scores. Therefore, RA was added to the mixed ANOVA analyses as a covariate. To explore the overall effectiveness of the intervention, three ANCOVA's (RA used as a covariate) were conducted on each outcome measure.

To explore whether there was a difference in intervention effect between each site (Goderich, Hastings, Kerry Town and the rural NGO group), three mixed ANCOVAs were conducted (one per measure).

To test whether there was a difference in intervention effect between participants of high- and low-risk ETC roles, mixed ANOVAs were conducted (one per measure).

## **Results**

### Participants

The 253 participants were aged between 19 and 53 years ( $M = 30$ ,  $SD = 7.04$ ), 181 were male (71.5%) and 58 were female (22.9%). The remaining 14 (5.5%) did not specify a gender. 181 (71.60%) of the participants worked in 'high risk' infection areas of the ETCs, 47 (18.60%) worked in 'low-risk' areas and the remaining 25 (9.90%) were participants whose risk of infection we could not identify.

The RA of participants also differed: 105 (41.50%) were "*fluent*", 61 (24.10%) understood "*most words*", 42 (16.60%) knew a "*few words*" and 17 (6.70%) could comprehend "*barely anything*". Only 28 (11.10%) did not specify their RA. In terms of occupation, 136 were unemployed (53.80%), 80 were employed (31.60%) and 32 (12.60%) were students. The outstanding five (2.00%) did not clarify their employment status.

### *Group allocation*

Table 1 details the number of CBT groups that were conducted per ETC group and the number of participants seen at each location.

### Effectiveness of the intervention

For each of the three outcomes, improvements were observed between T1 and T2. Table 2 shows the mean scores of each measure at the two time points.

#### *Anxiety*

The mixed ANCOVA found a significant main effect of the intervention  $F(1, 143) = 12.79$ ,  $p = < 0.0005$ ,  $\eta^2_p = .082$ , whereby anxiety scores were lower at T2 compared to T1.

#### *Depression*

The mixed ANCOVA found a significant main effect of the intervention  $F(1, 142) = 4.81$ ,  $p = .030$ ,  $\eta^2_p = .033$ . Depression scores at T2 were lower than T1.

#### *Functional impairment*

The mixed ANCOVA found a significant main effect of the intervention  $F(1, 141) = 37.81$ ,  $p = < 0.0005$ ,  $\eta^2_p = .211$ . Scores at T2 were lower than T1.

#### Difference in Effect at each ETC site

In general, our analyses found that the Rural and Hastings groups had the largest decreases in symptoms. Table 3 shows the overall average scores for each ETC group across each measure, as well as the mean scores at T1 and T2.

#### *Anxiety*

The mixed ANCOVA showed a significant group effect of location, measured by assessing difference in ETC groups,  $F(3, 143) = 11.69$ ,  $p = < 0.0005$ ,  $\eta^2_p = .20$ . Post-hoc Bonferroni pairwise comparison analyses revealed that anxiety scores in the Rural groups were significantly lower than the Hastings ( $p = .024$ ), Goderich ( $p = < .0005$ ) and Kerry Town groups ( $p = .001$ ). Anxiety scores in the Hastings group were significantly lower than in the Goderich groups ( $p = .015$ ).

The interaction between ETC group and effect of the intervention was significant  $F(1, 143) = 19.28$ ,  $p = < 0.0005$ ,  $\eta^2_p = .29$ . Anxiety scores in the Hastings and Rural groups decreased between

T1 and T2. Meanwhile, anxiety scores in the Goderich and Kerry Town groups did not change between T1 and T2.

#### *Depression.*

The mixed ANCOVA showed a significant group effect of location, measured by assessing difference in ETC groups,  $F(3, 142) = 9.44$ ,  $p < 0.0005$ ,  $\eta^2_p = .17$ . Post-hoc Bonferroni pairwise comparison analyses revealed that depression scores in the Rural group were significantly lower than the Goderich ( $p < 0.0005$ ) and Kerry Town groups ( $p = .014$ ). In addition, the depression scores in the Hastings group were significantly lower than the Goderich group ( $p = 0.29$ ).

The interaction between ETC group and effect of the intervention was significant  $F(1, 142) = 13.08$ ,  $p < 0.0005$ ,  $\eta^2_p = .22$ . Depression scores in the Hastings and Rural groups decreased between T1 and T2. However, scores did not change in the Goderich and Kerry Town groups between T1 and T2.

#### *Functional Impairment.*

The mixed ANCOVA showed a significant group effect of location, measured by assessing difference in ETC groups,  $F(3, 141) = 12.32$ ,  $p < 0.0005$ ,  $\eta^2_p = .208$ . Post-hoc Bonferroni pairwise comparison analyses revealed that functional impairment scores in the Rural group were significantly lower than in the Hastings ( $p = .004$ ), Goderich ( $p < 0.0005$ ) and Kerry Town groups ( $p < 0.0005$ ).

The interaction between ETC group and effect of the intervention was significant  $F(1, 141) = 17.86$ ,  $p < 0.0005$ ,  $\eta^2_p = .275$ . Functional impairment scores in the Hastings and Rural groups decreased between T1 and T2. Whilst, scores did not change in the Goderich and Kerry Town groups between T1 and T2.

#### Difference in anxiety and depression morbidity between ETC Roles involving High- and Low-risk

No significant differences were found in scores on anxiety, depression or functional impairment between high- and low-risk groups.

## Difference in intervention effectiveness between ETC Roles involving High- and Low-risk

Overall, we found no interaction between role risk and improvement over time.

### Feedback Questionnaire

The majority of the participants understood ‘most’ (43.4%) or ‘all’ (36.7%) of the content of the intervention. Likewise, 60.8% of the participants reported that the intervention helped them to their personal goals or recovery ‘a great deal’. Overall, the intervention was given a mean rating of 4.44 out of 5 by the participants.

### **Discussion**

The current study evaluated the effectiveness of group CBT for anxiety, depression and associated functional impairment across two time points in a self-selecting sample of former ETC staff in Sierra Leone. Across all groups, there were significant improvements in symptoms of anxiety, depression and functional impairment. When analysed individually by site, significant pre- and post-intervention differences were found in some locations (both rural and Hastings), but not others (Goderich and Kerry Town).

There are several possible reasons for the difference in the effectiveness of the intervention in the different locations. The lack of change between Kerry Town and Goderich groups could be the result of staff burnout since the facilitators of these groups conducted more sessions and saw more participants over the course of the intervention (Rosenberg et al., 2006). With more clinical contacts also comes a greater risk of compassion fatigue and secondary traumatisation (Rothschild, 2006; Pearlman et al., 1995). Collectively, these factors could have had detrimental effects on both the health of the staff member and their ability to deliver effective sessions (Morse et al, 2012). Attention should also be paid to the different historical contexts of each of the specific ETCs and the impact of these on the staff working there. Kerry Town, for example, was the first ETC set up by DfID, and encountered teething-problems because of this. Meanwhile, the Goderich ETC was the only one that did not have any specific psychosocial staff to offer support to the local workers during the epidemic (Hunter et al, 2015). Although not measured, attendee characteristics, which possibly differed

between groups, may and have also impacted the effectiveness of the intervention through altering group processes. These include installation of hope and group cohesiveness, both known to influence outcomes of group CBT (Whitfield, 2010).

The current study also explored whether participants who had worked in ETC roles involving a high risk of infection experienced higher levels of mental health difficulties at the start of phase 3, compared to those who had worked in lower risk roles. The results suggested this was not the case. This is contrary to previous research, which suggests that individuals with a greater risk of traumatic event exposure are more likely to experience greater mental health difficulties and therefore, require more intense treatment (Hughes, 2015). This finding is likely to be due to a multitude of risk- and protective factors, which cannot be disentangled through this study's non-controlled design. One reason for our result may have been that many of the individuals in high-risk roles received pre-deployment training or held qualifications that gave them the knowledge, confidence and skills to perform, psychologically protected, under challenging conditions (Brooks et al., 2015; Howe et al., 2012). This has also been shown amongst military populations during the Iraq war, whereby elite forces had better mental health than other forces, despite seeing more trauma, which was explained as a result of their higher level of preparedness (Sundin et al, 2010).

The observed reduction in depression and functional impairment scores amongst the whole sample was clinically significant, whereby the sample came to reflect 'moderately severe' and 'moderate' thresholds respectively at post-intervention. The anxiety scores did not display a clinically significant reduction and remained within the 'moderate' range at both time points, despite reducing with statistical significance. These findings suggest that although the intervention was effective in reducing symptoms, a longer intervention may be required to reduce them below all clinical thresholds. It is also possible that anxiety may have been harder to treat in this situation given that participants were still in a potentially threatening environment, fearing the return of Ebola. Meanwhile, the feedback questionnaire results suggested that the participants were highly satisfied with the intervention and felt that it helped them towards their personal goals and recovery, irrespective of the barriers of implementation (see Waterman et al., 2019).

Preliminary analyses indicated a negative correlation between RA and scores on the GAD-7, PHQ-9 and WSAS. Future interventions should be aware of this, particularly those focusing on prevention of mental health difficulties as these results suggest lower literacy populations may be more vulnerable. Furthermore, it shows the importance of ensuring all that interventions are suitable for less literate populations. Studies conducted in Latin America and Pakistan have suggested the use of alternative materials such as multimedia videos or animations to supplement CBT groups (Naeem et al, 2014; Chavira et al, 2015). However, this may be difficult in Sierra Leona, where many do not have access to a computer. Instead, future interventions should ensure all materials are adapted for a low literacy population and where possible, facilitators should offer necessary support to ensure that all participants can engage with the group.

This study has several limitations. Most importantly, the study lacked a controlled design and was instead, naturalistic. Without a control group, it is not possible to determine whether the positive effects on anxiety, depression and functional impairment were due to the intervention or other unknown or known confounding variables, such as employment status or urbanicity. However, efforts were made to control for RA; a confounder of therapy efficacy (Wampold, 1997). Furthermore, no follow-up data was collected, meaning that it was not possible to determine whether the intervention had any beneficial effects beyond the initial intervention period. Likewise, data was not collected following each session, in favour of a pre- and post-design, under the assumption that this would be onerous for participants, especially for those needing help to complete the forms, which may have contributed to non-attendance (Marshall et al., 2015). Given this, the opportunity to track participant progress was missed; a factor that has been shown to improve outcomes (Lambert et al., 2003).

The study was also limited by several factors related to culture. Firstly, anxiety and depression severity was measured using the GAD-7 and PHQ-9, both of which were developed in the West. Therefore, unless the measures undergo the conversion process outlined by Canino and Bravo (1994), their reliability and validity is not guaranteed in non-western countries, including Sierra Leone (Sweetland et al., 2014). However, since the measures were administered by the facilitators, it

gave the participants an opportunity to seek clarification on its constructs, which may have been better understood through conceptualisations embedded in local language.

To conclude, this study is the first of its kind, to our knowledge, for two reasons. Firstly, there is no published literature that evaluates a manualised psychological therapy such as CBT for ETC staff exhibiting these mental health problems and functional impairment or for LMIC frontline staff during an epidemic. Secondly, the study indicates that group CBT may be a feasible treatment for mild to moderate mental health problems within the wider Sierra Leonean context.

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## Figures

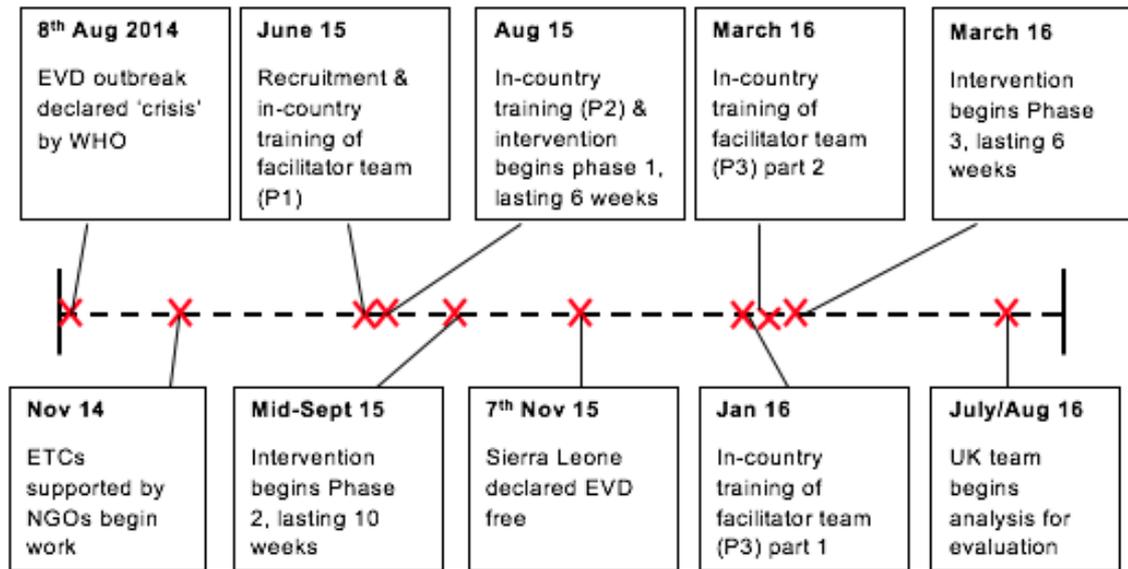


Figure 1 – Timeline of Intervention and national EVD status in Sierra Leone



Figure 2 – Map showing the location of 6 DfID funded ETCs in Sierra Leone (Google, 2017)

## Tables

*Table 1. Participant allocation and number of CBT groups run per group*

<i>Group</i>	<i>Groups run</i>	<i>Participants seen</i>
Goderich	6	87
Kerry Town	6	73
Hastings	3	41
Rural	5	51

*Table 2: Mean (M), Standard Error (SE) and Confidence Intervals (CI) of scores for each measure at T1 and T2*

Measure	T1			T2		
	M	SE	CI	M	SE	CI
GAD-7	13.42	.49	12.45-14.38	8.96	.47	8.03-9.89
PHQ-9	15.41	.66	14.10-16.72	10.90	.61	9.96-12.11
WSAS	24.58	.96	22.67-26.48	17.29	.84	15.64-18.95

*Table 3: Overall average, T1 and T2 scores across all measures for each ETC group*

	ETC group	T1			T2		
		M	SE	CI	M	SE	CI
GAD-7	Rural	11.50	1.24	9.04-13.95	4.04	1.20	1.67-6.41
	Hastings	16.33	.95	14.45-18.22	5.78	.92	3.97-7.60
	Goderich	13.85	.74	12.38-15.32	13.65	.72	12.23-15.07
	Kerry town	11.99	.90	10.20-13.77	12.39	.87	10.67-14.11
PHQ-9	Rural	12.87	1.71	9.49-16.26	5.52	1.58	2.40-8.64
	Hastings	18.68	1.28	16.15-21.21	7.60	1.18	5.27-9.93
	Goderich	16.02	1.00	14.05-18.00	16.90	.92	15.08-18.72
	Kerry town	14.07	1.22	11.67-16.47	13.58	1.12	11.37-15.80
WSAS	Rural	21.50	2.44	16.68-26.32	5.40	2.12	1.22-9.59
	Hastings	28.70	1.84	25.05-32.35	13.26	1.60	10.09-16.42
	Goderich	24.87	1.49	21.93-27.80	25.48	1.29	22.94-28.03
	Kerry town	23.24	1.82	19.64-26.83	25.03	1.58	21.91-28.15