

Background Quality Report for the Continuous Working Patterns (CWP) Survey

July 2014

1. Introduction

1.1 Overview

The Continuous Working Patterns Survey is a diary completed by Service personnel to record the number of hours worked over seven days. The aim of the survey is to describe the working patterns of the British Armed Forces for a full working week - showing the average weekly hours personnel spend at work, on call and on duty, broken down by Service, rank group and location. The report is produced annually. Each report contains information about the working patterns of Service personnel over the last five years.

1.2 Background and Context

Chief of Defence Personnel (Personnel & Training) sponsors the survey under a remit from the Armed Forces Pay Review Body (AFPRB). The AFPRB provide advice to the Prime Minister and the Secretary of State for Defence on the remuneration and charges for members of the British Armed Forces.

Defence Statistics (formerly known as Defence Analytical Services and Advice prior to April 2013) have been providing the AFPRB with information about the working patterns of Service personnel since 1987/88.

Since 1987/88, a number of changes have been made to the survey. For example, prior to 1995/96 the survey excluded Officers, and prior to 1996/97, Royal Marines were excluded. The locations for the Army and RAF have changed over the years depending on where Service personnel have been stationed or deployed. The analysis methodology has also changed, moving from substitution (respondents with leave days recorded in their diaries had these days substituted with means calculated using the diaries of personnel who did not record any leave), to calculating a notional week, based upon the average Monday, the average Tuesday,, the average Sunday.

1.3 Methodology and Production

Stage 1: Questionnaire Design

Single Service questionnaires are used for the Naval Service (Royal Navy and Royal Marines), the Army and RAF. All three single Service questionnaires contain a seven day diary, with each day divided into four periods of six hours. Personnel are asked to record the number of hours they spent at work, on breaks, on call and off duty for each of these periods. Personnel across all three Services are provided with guidance on how different activities should be recorded.

As well as completing a seven day diary about their working patterns, respondents are asked to record their Service number, rank group, location, principle activity for the week recorded, start date of the diary and information about their designated state of readiness over the seven day period. Personnel are also asked to complete two questions about leave. Responses to these two leave questions are used to inform another statistical output about the leave patterns of Service personnel.

Questions are the same for all three Services, except those listed below:

- For the Naval Service, Officers are asked for their specialisation, Naval Ratings and Royal Marine Other Ranks are asked what branch they are in.
- For the Army, personnel are asked for their regiment / corps.
- For the RAF, Officers are asked for their specialisation, Airman and Airwomen are asked what trade group they are in.

Stage 2: Sample

The target population is regular members of the British Armed Forces who were full time, trained strength. It excludes untrained personnel, those on long term absence, Special Forces, Gurkhas, FTRS, and personnel ranked above OF-6. There are a number of other minor exclusions arising from the practicalities of running the survey e.g. those with invalid address data.

The CWP is designed as a stratified sample survey. The stratification is by:

- Service: Naval Service (Royal Navy and Royal Marines), Army and RAF.
- Rank Group: Senior Officers, Junior Officers, Senior Ranks/Rates and Junior Ranks/Rates.
- Location:
 - Naval Service: Ship and Shore.
 - Army: United Kingdom, Germany, Deployed on Operations and Elsewhere Abroad.
 - RAF: United Kingdom, Deployed on Operations and Elsewhere Abroad.

The sample size and sampling methodology are designed to give a margin or error of +/- 0.5 hours for overall Service averages and +/- 1.0 hours for each rank group and location average.

Stage 3: Distribution

This survey is conducted using paper questionnaires. Questionnaires are packed by external contractors and dispatched via the British Forces Post Office, RAF Northolt. Address details are obtained from the Joint Personnel Administration System (JPA).

For surveys prior to 2012/13, questionnaires were batched and sent to Commanding Officers who then distributed them to their staff and reminders were also sent to Commanding Officers who had a unit response rate of less than 50%, and at least 4 non-respondents. In 2012/13, time constraints in the packing process meant that questionnaires were sent to individuals directly. Cost constraints also meant that reminders were not sent.

A response is considered valid if at least one day within the seven day diary is useable. The valid response rate for the 2012/13 survey was 17%. In the previous survey conducted in 2011/12, the valid response rate was 37%. Therefore, the valid response rate for the 2012/13 survey was twenty percentage points lower than the previous survey.

For the 2013/14 survey, questionnaire distribution was reviewed, and the decision was made to batch questionnaires and send to Commanding Officers, but not to send any reminders.

For the 2013/14 survey, questionnaires were distributed to the sample in two waves, the first was sent out in September 2013 and the second in February 2014. Questionnaires were returned in postage-paid envelopes.

For the 2013/14 survey, a total of 17,696 surveys were distributed. 4,553 of the returned surveys were considered valid, which equated to a valid response rate of 26%, nine percentage points higher than the 2012/13 survey.

Stage 4: Analysis

Many personnel returned questionnaires which included leave days or days that had to be discarded because of inconsistent or missing data. If analysis was restricted to only those questionnaires that cover a full working week, results would be based on much less data and confidence intervals would be considerably wider. Therefore, the methodology used is based upon a 'notional' week made up of the average Monday, the average Tuesday, ..., the average Sunday. By calculating the average working hours separately for each day, as much of the data as possible is used.

The sample design and the difference in non-response between Services, rank groups and locations mean that the distribution of characteristics of respondents do not reflect their distribution in the Armed Forces. This means that some types of personnel were over-represented and others underrepresented. The survey data are weighted by Service, rank group and location to ensure that the respondent profile matched the known population profile by these characteristics. The weights are calculated simply by:

$$\text{Weight} = \frac{\text{Population size within weighting class (p)}}{\text{Number of responses within weighting class (r)}}$$

Weighting in this way assumes missing data are missing at random (MAR) only within strata. This means that we assume that within a single strata the working patterns of non-respondents are similar (on average) to the working patterns of respondents.

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Defence Statistics welcomes feedback on this Background Quality Report or any of the statistics mentioned. Statistical outputs produced by Defence Statistics can now be found on the [Statistics at MOD page¹](#) of GOV.UK.

2. Relevance

Chief of Defence Personnel (Personnel & Training) sponsors the survey under a remit from the Armed Forces Pay Review Body (AFPRB). The AFPRB consider information about the working patterns of Service personnel when providing advice to the Prime Minister and the Secretary of State for Defence on the remuneration and charges for members of the British Armed Forces.

CWP provides information about the following:

- Average number of hours worked per week
- Distribution of hours worked
- Average number of hours spent on duty per week
- Average number of hours spent on call per week
- Distribution of duty hours

This information is provided at Tri-Service level and for the Naval Service (Royal Navy and Royal Marines), the Army and RAF. Within each single Service, this information is also provided by rank group and location. For the Tri-Service, additional information about working unsociable and excessive hours are provided.

In order to detect differences in working patterns between the current year and the previous year, statistical comparisons are made. To identify trends, information about the working patterns of Service personnel over a five year period are presented in the report

3. Accuracy

CWP collects data about working patterns from a stratified sample of approximately 18,000 trained Regular Armed Forces personnel. The sample is stratified by Service (Naval Service (Royal Navy and Royal Marines), Army and RAF), Rank group and location:

Rank group	NATO Rank
Senior Officers	OF7 - OF10
Junior Officers	OF1 - OF6
Senior Ranks	OR6 - OR9
Junior Ranks	OR1 - OR4

Service	Location
Naval Service	Ship / at Sea
	Shore
Army	United Kingdom
	Germany
	Deployed on operations
	Elsewhere abroad
RAF	United Kingdom
	Deployed on operations
	Deployed on operations

Survey estimates are published by Rank group and location for each of the three Services. The survey is designed to achieve a margin or error of within 0.5 hours for each Service estimate and 1.0 hours for each Rank group and location estimate. The margins of error for Naval Service personnel based at Sea and Army and RAF personnel deployed on Overseas Operations and Elsewhere Abroad are wider than Service personnel based at other locations.

The CWP raw data is passed through a range of automatic and manual validation and editing processes. Each of the data sets from the three Services is kept separate. To ensure the results are representative of the Armed Forces, Defence Statistics weight responses to correct for any bias, introduced by the disproportionate stratified sample design and differing levels of response. The responses are weighted broadly by Service, Rank group and location.

Defence Statistics analyse the data using Excel. Using this software, we can apply the complex cleaning rules to the data, produce weighted estimates and corresponding standard errors. Many aspects of the CWP analysis has been automated and this helps to minimise the risk of error and improve timeliness. Where year of year comparisons are possible, 5% level z-tests are carried out. This level is used to minimise the possibility of finding false positive differences that can be expected when performing a large number of significance testing.

All statistical tables are checked by at least two Defence Statistics staff. Defence Statistics do not show any statistics where the responding group size is less than 30. This is to prevent the publication of unreliable statistical information and to prevent disclosure of information about individuals.

As CWP does not achieve a response rate of 100%, there is always a risk that those who returned questionnaires have different working patterns to those that did not. We have assumed that all non-response is Missing At Random (MAR). This means we have assumed that those personnel who did not return their questionnaires have (on average) the same working patterns as those who did respond.

The CWP data has been weighted by Service and Rank to compensate for:

1. the design of the survey, which disproportionately samples personnel by Service, Rank and location; and
2. variations in response rates between the different Services, Rank groups and locations.

Weighting helps to make the CWP estimates as representative as possible of the Armed Forces population. The Services / Rank groups / locations that are under-represented in the dataset are given more weight so that they represent more of the people in their group who were not sampled or did not respond. Conversely, groups that are over-represented in the dataset are given less weight. Weighting assumes that all non-response is Missing At Random (MAR). This means we have assumed that all those people who did not respond within their Service / Rank group / location have (on average) the same working patterns as those who did respond. If those who did not respond have different working patterns to those who did respond then the observations in this report will be biased and will not represent the working patterns of all Trained Armed Forces personnel; rather, our observations would only represent the views of the responding population.

It should be noted that response rates for Naval personnel at Sea, Army personnel based in Germany or Elsewhere abroad and RAF personnel who are deployed on Overseas Operations are lower than personnel based at any other location. Response rates are also lower for Junior Ranks than any other Rank group.

CWP is designed to inform users of the working patterns of our Armed Forces. While CWP is reported on an annual basis it should be remembered that these working patterns are liable to change within the calendar year, for example, as a result of events or the time of the year that the diary was completed (a seasonality effect).

It is important to note that there are some methodological limitations which may affect the accuracy of the results. Non-response that is directly related to individual working patterns will lead to bias within the survey results. For example, those busiest and hence working longer hours may be less likely to complete the survey.

Respondents are asked to record their working pattern for a full working week. A daily diary divided into four periods of the day is provided but respondents may complete this retrospectively, leading to recall bias. Several studies (Carstensen and Woltman.1979; Rodgers et al. 1993; Barron et al.1997) comparing company records with respondents' reports of hours worked found that individuals tended to overestimate the number of hours worked. A further study by Presser and Stinson (1998) found that employing time-use diaries was an effective means for reducing, but not eliminating, response error associated with retrospective recall bias as well as bias associated with the over reporting of socially desirable behaviour. Hence, readers should be aware that the potential remains for an upward bias in measures of time spent at 'work' or 'On Call'.

4. Timeliness and Punctuality

4.1 Timeliness

Overall, CWP takes approximately 12 months to complete, from agreeing the questionnaires to publishing the report. This includes approximately:

- 4 weeks to print paper questionnaires for wave 1
- 4 weeks to pack and distribute paper questionnaires for wave 1
- 16 weeks infield for wave 1
- 4 weeks to print paper questionnaires for wave 2
- 4 weeks to pack and distribute paper questionnaires for wave 2
- 12 weeks infield for wave 2
- 2 weeks to obtain data sets from contractor
- 1 week data preparation
- 3 weeks analysis and producing tables and graphs
- 2 weeks report writing
- 2 weeks checking tables, graphs and written report

Postal questionnaires need at least ten weeks infield to ensure enough time is given for respondents to receive the questionnaires, complete them and return them before the survey closes.

It is important to note that the working patterns of Service personnel are liable to change within the calendar year, due to seasonal variations in working patterns or as a result of events or announcements. Therefore, questionnaires are sent out in two waves, the first wave is sent out in September, and the second wave is sent out in February. Once the data for both waves have been received from the contractor it takes Defence Statistics staff approximately 8 weeks to produce and publish the statistical report.

4.2 Punctuality

As an Official Statistic, the release date for Bulletin 6.06 was pre-announced on the [MOD's Calendar of Upcoming Releases](#)² section of GOV.UK in accordance with the guidance set out in the [Code of Practice for Official Statistics](#)³.

5. Accessibility and Clarity

5.1 Accessibility

The CWP report is published on the 'Statistics at MOD' area of the GOV.UK website as a PDF document. This Background Quality Report is published as a PDF document alongside the CWP report.

5.2 Clarity

In addition to this quality report, the CWP report contains a key points section that summarises the main CWP findings, an introduction and methodology section that provides a brief background to CWP, definitions of terms used in the report, details of the target population, information on the sample, respondents, weighting and statistical tests used.

Tables and graphs are used to illustrate trends in the Armed Forces working patterns over the past five years and to highlight significant differences between the 2012/13 and the 2013/14 survey. Commentary to these graphs and tables have also been provided. Where there have been issues with the data, the time series comparisons or revisions have been made, this has been noted at the beginning of the relevant section of the report.

6. Coherence and Comparability

6.1 Coherence

CWP is the definitive source of data about the working patterns of Service personnel. There are no other Tri-Service data sources that collect the same information on working patterns with which to ensure coherence.

In February 2014, the Army's Family Federation produced a Working Hours Survey. However, neither the content nor the methodology is harmonised. Information about the working patterns of Army personnel were obtained by asking multiple choice questions such as 'in the last two years, have your soldier's working hours increased?' and 'on average, how many hours a day does your soldier work for?'. The survey was conducted using online questionnaires and face to face interviews and was completed by the family of the Service personnel.

6.2 Comparability

CWP surveys are considered to be comparable over time. However, there have been changes to the location categories for the Army and RAF to reflect where Army and RAF personnel are stationed or deployed. Where possible, revisions have been made to figures from previous surveys to ensure comparability over time.

For example, in 2009/10, for the Army and RAF, the location category "Elsewhere" was separated into "Overseas Operations" and "Elsewhere abroad", as population strengths for personnel based on Overseas Operations was of sufficient quality to be used for weighting. To enable comparisons to be made, figures for 2007/08 and 2008/09 were revised using these new population strengths. Figures prior to 2007/08 were not revised and therefore, cannot be compared with figures from 2007/08.

In 2012/13, due to the small number of returns from personnel based in Northern Ireland, the location categories "Great Britain" and "Northern Ireland" were combined into one single location category, the "United Kingdom" for the Army and RAF. Figures for 2008/09, 2009/10, 2010/11 and 2011/12 were revised so that comparisons could be made to 2012/13. Figures prior to 2008/09 were not revised and therefore, cannot be compared with figures from 2008/09.

In the 2012/13 and 2013/14 surveys, the CWP questionnaires were issued in two waves. In previous surveys, questionnaires were issued in three or four waves. The rationale for distributing questionnaires in several waves during the year was in the hope of obtaining survey estimates that might be more representative of the entire year and less influenced by seasonal variations (or events/announcements etc). The reduction in the number of waves being sent out was due to cost and time constraints. It's possible that responses vary systematically throughout the year (seasonality effects). We have assumed that there is little or no seasonality effect when comparing results of CWP surveys based on 2, 3 or 4 waves. The reader should be aware that if responses do vary systematically depending on the period of data collection then the change in number of waves may impact on the comparability of responses between surveys.

7. Trade-offs between Output Quality Components

The main trade-off is between comparability over time, costs and accuracy. From 2012/13, CWP questionnaires moved from being issued in three or four waves to being issued in two waves. The move to two waves was to lower the administration cost. The rationale for distributing questionnaires in several waves during the year was in the hope of obtaining survey estimates that might be more representative of the entire year and less influenced by seasonal variations (or events/announcements etc). The reader should be aware that if responses do vary systematically depending on the period of data collection then the change in number of waves may impact on the comparability of responses between surveys as well as the accuracy of our estimates.

8. Assessment of User Needs and Perceptions

Defence Statistics work closely with the main customer and survey sponsor, Chief of Defence Personnel (Personnel & Training) to ensure that the statistics in the CWP report are relevant to policy requirements.

9. Performance, Cost and Respondent Burden

9.1 Performance and cost effectiveness

The external contractor cost for the 2013/14 survey is approximately £32,000 (including VAT) and includes packing, distributing and data processing of the CWP questionnaires. Costs are closely monitored and Defence Statistics strive to balance quality and timeliness against costs.

9.2 Respondent burden

Response to CWP is voluntary. Participant information is provided within the questionnaire to encourage informed consent. The CWP questionnaire is currently estimated to take between fifteen and thirty minutes to complete every day. Therefore, this survey could take between one hour and forty five minutes and three hours and thirty minutes to complete over the seven day period.

10. Confidentiality, Transparency and Security

10.1 Confidentiality

Confidentiality protocols are adhered to, as set out in the Defence Statistics Disclosure and Confidentiality Policy – Identifiable Survey Data. CWP is a confidential survey rather than anonymous. The raw data is not seen by anyone outside of Defence Statistics which ensures that no person from any respondents' chain of command is able to access individual level data. Only aggregated results are provided to anyone not directly involved with the analysis. The results are only presented for groups containing at least 30 respondents.

10.2 Transparency

The production process is considered to be transparent. Each questionnaire is distributed with a participant information sheet to ensure that respondents make an informed decision before completing the survey. The CWP report is published with details of the methodology so that users are aware of potential data issues. This quality report informs users of the method, production process and quality of the output. Any significant errors identified after publication will result in revisions along with explanations as to the cause of the revisions. A list of those posts that require 24hr pre-release access to the statistical results are published on the [Defence Statistics pre-release access list](#)⁴¹ section of the GOV.UK website.

10.3 Security

All staff involved in the CWP production process adhere to the MOD and Civil Service data protection regulations. In addition all members of the survey analysis team have to follow the relevant codes of practice for the Government Statistical Services (GSS). All data is stored, accessed and analysed using the MOD's restricted network and IT system.

11. References

	Reference	Website Location
1	Statistics at MOD Homepage	https://www.gov.uk/government/organisations/ministry-of-defence/about/statistics
2	MOD's Timetable of Future Releases of National and Official Statistics	https://www.gov.uk/government/publications/mod-timetable-for-future-releases-of-national-and-official-statistics
3	Code of Practice for Official Statistics	http://www.statisticsauthority.gov.uk/assessment/code-of-practice/code-of-practice-for-official-statistics.pdf
4	Defence Statistics Pre-release Access lists	https://www.gov.uk/government/publications/defence-statistics-pre-release-access-list

Last updated: July 2014