ACCURACY OF DEPLOYMENT MEASURES

ACCURACY OF EPISODE COUNT

Although we think the episode count is largely accurate, it may deviate from the true count for the reason that FSA and HFP are not meant to count episodes. Instead, they are meant to pay for the circumstances of being separated from dependents or having hostile duty at any time in a month. Here are possible examples of episode undercounts:

- An aircrew member makes two flights into hostile territory in a month but receives only a single HFP payment for the month.

- A member of a special-forces unit goes on hostile missions in two consecutive months, but because the months are consecutive, only a single episode is counted.

- A member with dependents is posted on an unaccompanied tour and during the tour is sent on a humanitarian mission in non-hostile territory. The member receives FSA throughout this entire period, and a single episode is inferred.

- A member may have also received a single catch-up payment for two or more episodes that were separated by periods without any deployment.

Data are not available to determine whether these examples represent rare or common occurrences, but the examples suggest that the use of FSA and HFP may result in some undercount of episodes. Still, the definition of "episode" need not go hand in hand with the num-

ber of particular missions. For instance, in the above example the air crew member made two separate flights into hostile airspace, but these might have been part of an overall operation lasting for weeks or months. The duration of the operation might be a more relevant measure of the episode than the number of flights into hostile airspace. If so, the fact that PERSTEMPO data might undercount the number of such flights would become irrelevant—the data would provide an accurate indicator that the aircrew member was involved in a hostile operation.

Another possible inaccuracy comes from the imputation of deployment to members without dependents. The imputation helps to identify nonhostile deployments. Hostile deployments, in contrast, are detected through HFP, which is receivable by members regardless of whether they have dependents. The imputation of nonhostile deployments can be inaccurate in certain cases, as the following examples illustrate:

- A unit is deployed but does not meet the criteria for imputing deployment to its members without dependents. In particular, fewer than 30 percent of unit members have dependents.

- A unit is deployed, but a member is ill or injured and either cannot deploy with the unit or has been sent back during deployment to recover. In this case, deployment is imputed to the member even though the member is not deployed while ill or injured.

- A unit is not deployed, but a member is attached to another, deploying unit that needs the member's specialty for the mission it has been given. In this case, the member deploys, but deployment is not imputed. The member's deployment is missed entirely unless it involves hostile duty.

It is possible to check the accuracy of the imputation algorithm by making use of data on personnel with dependents, for whom complete deployment data are available (insofar as deployment can be inferred from FSA and HFP). Thus, for members with dependents, we compared the episode count based on their actual FSA and HFP receipt with the episode count they would have had if handled as members without dependents. Again, the episode count of members

Table B.1

Weighted Kappa Values for Episode Counts

Episodes	Army	Navy	Air Force	Marine Corps
Total	0.89	0.85	0.98	0.95
Hostile	0.99	0.99	0.99	0.99

without dependents depends on HFP and an imputation based on unit deployment. The closeness of these counts is measured by the value of a weighted Kappa statistic, which measures the concordance between two categorical variables above that expected by chance, and the weighting recognizes that the agreement should occur along the diagonal. That is, if true episodes are equal to two, then ideally episodes based on imputation should equal two, etc. The maximum value of the weighted Kappa is one.

Table B.1 presents the weighted Kappa values for episode counts for our first- and second-term reenlistment samples by service. As seen, the values are all quite high, implying that episode counts for personnel without dependents are nearly as accurate as the counts for those with dependents. This is an important finding because most of our analysis uses episodes as the measure of deployments.

ACCURACY OF MONTH COUNT

The number of months in an episode of deployment is defined here as the string of months of in which FSA or HFP payments are received or a unit-deployed indicator is "on." There are several limitations of this approach. Its degree of resolution is the month, not the week or day, so there will be some inexactness about the actual length of the episode. Related to this, the receipt of payment does not have a one-to-one correspondence to the actual months in which the member was deployed. The first payment typically covers more than one month of deployment, and the last payment typically covers less than one month of deployment. The reason for this is that paperwork to document the member's eligibility for payment may not be turned in immediately, but instead may be batch-processed in a certain week of the month. Furthermore, in the case of FSA a member must be away for at least 30 days—a whole

month—before becoming eligible to receive FSA, and as a result the member's first payment will typically cover a span of more than 30 days.

The PERSTEMPO data contain information about the receipt but not the amount of payment. Therefore, these data cannot be used to adjust the months of receipt of payment to reflect the number of months of deployment. To obtain information about the extent to which months of receipt undercount actual months of deployment, we made use of a separate data file containing data on the amount of FSA payments made to members in September 1997. These data are from the Joint Uniformed Military Pay System and were provided to us by the Defense Manpower Data Center. Because FSA payments are prorated to the number of days away per 30-day period, they can be used to infer the actual amount of time away. For instance, a member would receive $75 for a month in which he or she was away for at least 30 days, $150 for two months away, and $37.50 for 15 days away. In contrast, HFP payments are made when the member has hostile duty at any time in a month; the member is paid $150 whether the duty lasted the entire month or merely one hour.

Table B.2 tabulates the distribution of FSA payment amounts. The payments range from negative amounts, indicating the payback of

Table B.2

Distribution of FSA Payments in September 1997

Payment Amount	Fraction Receiving	Average Value	Value in Months
Negative	0.03	–$23	–0.31
$1–$74	0.22	$45	0.60
$75	0.62	$75	1.00
$76–$150	0.09	$111	1.47
$151–$225	0.02	$180	2.40
> $225	0.02	$314	4.19
Overall	1.00	$76	1.01
> $75	0.13	$154	2.05
> $75 but < $226	0.11	$123	1.64

past overpayments, to amounts in excess of $225, indicating a payment for three or more months away. A payment amount of $1 to $74 indicates a partial month away.

Utilizing certain assumptions, we can use the information in the table to make an estimate of the extent to which the months of receipt of FSA underestimates the actual months away. First, we assume that payments in excess of $75 can be used to estimate the average size of the first payment in an episode of deployment. This assumption comes from the notion that the first payment typically covers more than one month away. (Recall that FSA cannot be paid until the member has been away for at least 30 consecutive days.) Second, we assume that payments between $1 and $74 can be used to estimate the average size of the last payment in an episode of deployment. It is reasonable to suppose that most last payments cover only a fraction of a month. For instance, consider a deployment scheduled to be three months long. Only if the deployment began on the first day of a month and ended exactly as planned on the last day of the third month would the last FSA payment be $75. In other cases, the deployment would begin and end mid-month and therefore the final payment would be for part of a month.

We see from Table B.2 that 62 percent of the FSA payments were for $75 and therefore covered a full month away. In addition, 22 percent of the FSA payments were $1 to $74, with an average value of $45. The average value corresponds to $45/$75 = 0.60 of a month away. Also, 13 percent of the payments were in excess of $75. These payments had an average value of $154 or 2.05 months away. Two percent of the payments were in excess of $225 and therefore covered more than three months away.[1]

These payments could be viewed as statistical outliers and trimmed from the computation. If they were trimmed (see the last row of Table B.2), the average value of payments greater than $75 would be reduced from $154 to $123 and cover 1.64 months rather than 2.05 months. It is not clear whether they should be trimmed, but the argument in favor of trimming comes from their influence on the undercount estimate made below. By including the extreme values,

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[1]These 2 percent are part of the 13 percent of payments greater than $75. They account for 2/13, or about 15 percent, of the payments greater than $75.

all members with a payment greater than $75 would be assumed to have an average undercount of 1.05 months, whereas for five out of six members the undercount would be no more than 0.64 months.

Using the assumptions and leaving the data untrimmed, the average first month payment covers 2.05 months and the average last month payment covers 0.60 months. The use of months of receipt of FSA therefore undercounts the beginning of an episode by 2.05 – 1.00 = 1.05 months on average, and overcounts the ending of an episode by 1.00 – 0.60 = 0.40 months. Therefore, there is a net undercount of 1.05 – 0.40 = 0.65 months per episode on average or about 2.5 weeks per episode. If the data are trimmed to exclude payments above $225, the beginning of the episode is undercounted by 1.64 – 1.00 = 0.64 months and the end is, as before, overcounted by 0.40 months. The net undercount is now 0.64 – 0.40 = 0.24 months per episode, or about one week.

Because members may have more than one episode of deployment, we present Table B.3 to show how these undercounts cumulate as the number of episodes increases.

As a final step, we put these estimates into perspective by referring to Table B.2, which shows that most members who are deployed have only one episode of deployment. Also, we have separately tabulated that the average length of a hostile episode for a member who had only one hostile episode is 4.6 months for the Army, 3.0 months for the Navy, 3.8 months for the Air Force, and 2.7 months for the Marine Corps. Using the trimmed estimate for the undercount of months, each of these figures would be increased by 0.24 months.

Table B.3

Estimate of Undercount of Months of Deployment per Episode

	Undercount of Months	
Number of Episodes	Raw data	Trimmed data[a]
1	0.65	0.24
2	1.30	0.48
3	1.95	0.72
4	2.60	0.96

[a]First month payment is assumed to be $76 to $225.