Longitudinal Change in Migraine Headache-Days and Indirect Cost Consequences: Results from the American Migraine Prevalence and Prevention (AMPP) Study

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BACKGROUND

In cross-sectional studies, the number of days with migraine headache is strongly associated with lost productive time (LPT) at work[1], a measure of indirect cost estimates.

Previous findings suggest that the work impact per headache-day decreases in a non-linear manner; which could be an artifact caused by those with the most severe and frequent headaches becoming unemployed[1].

While headache-days is known to change from year to year, no study to date has examined how LPT changes over time in relation to change in headache-days or whether the non-linear relation between headache-days and LPT is explained by transitions in employment status.

OBJECTIVE

To assess the association between change in headache-days over one year and change in LPT among a population sample of employable migraineurs.

METHODS

The American Migraine Prevalence and Prevention (AMPP) is a longitudinal, prospective, population-based study of severe headache sufferers (n=24,000) who completed a mailed questionnaire in one or more years from 2004-2009[2,3].

Eligible respondents for this analysis (N=8,094) were ≥ 18 years old, returned at least 2 consecutive questionnaires from the 2005 to 2008 surveys, met criteria for migraine, and were employable (i.e., working for pay or unemployed but looking for work) in at least one of the two consecutive years (defined as a **couplet**). For this analysis, couplets were the unit of analysis where change in work impact was examined in relation to change in headache-days.

LPT was estimated using two validated MIDAS questions[4] about missed work days and number of days at work where productivity was reduced by half (i.e. Half Days) and measured as Missed Work Days=0.5* (Number of Half Days).

In the analysis, we used linear (change in LPT) and logistic (change in employment status) regression and modeled the data for linear and non-linear trends. In addition, we looked at interaction terms between baseline headache-days and change in headache-days to determine if the longitudinal associations varied by baseline headache-days.

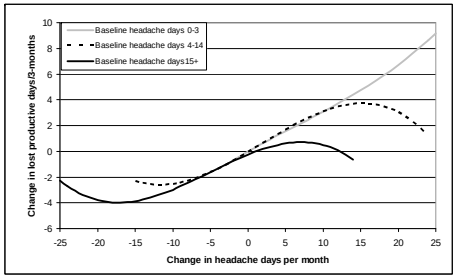
Data were modeled in two ways: 1) linear regression that was limited to people employed in both years of the couplet and 2) logistic regression that was limited to people employed in at least one year of the couplet.

RESULTS

A total of 8,094 migraineurs contributed data to 16,016 couplets.

Change in LPT from one year of a couplet to the next had a non-linear relationship with change in headache-days, with an asymptotic effect at the tails of the distribution. Figure 1 summarizes the relation of all coefficients for three headache-day subgroups (i.e., 0-3, 4-14, 15+ headaches/month), showing the non-linear trend.

Figure 1: Mean change in LPT and change in headache-days/mo amount those employed in both yrs of couplet



In logistic regression analysis (see Table 1), change in employment status from full or part-time employment to unemployed status had a non-linear relationship to change in headache-days. Only the quadratic term was statistically significant, indicating that the odds of employment had a non-linear relationship to headache-days.

Table 1: Logistic regression models and odds ratios for the relation between headache-days/month covariates and employment status* in the second year of a couplet given employed status in the first year.

	Covariate	OR	95% CI
Change in Headache- Days per month	Linear	0.9895	[0.9726, 1.0066]
	Quadratic	0.9986	[0.9978, 0.9995]

*Employed status in the first year was defined as full-time and part-time and as full-time only

We developed a measure of LPT that combined employment status and work productive-time status. For this combined measure, we assumed that transitioning from full-time employment to not being employed (i.e., unemployed, medical leave, or disabled) was equivalent to a change in MIDAS LPT of 60 (i.e., the equivalent of missing 60 working days in a 3 month period). Notably, when we modeled change in this composite measure, we found that LPT was directly and linearly related to change in headache-days (see Table 2). None of the non-linear terms or the interaction terms were statistically significant.

Table 2. GLIM Regression models for the relation between change in headache-days/month and change in LPT (i.e., expressed in lost productive days/three months) (12422 couplets, 6635 subjects)

Covariate	Term	β	95% CI
Change in Headache-Days per month	**Linear**	**0.246**	**0.110, 0.383**
Baseline Headache-Days per month	0-3	Ref	
	4-14	-0.028	-0.595, 0.537
	15+	0.2	-1.372, 1.773
Interaction between Linear Change*Baseline	0-3	Ref	
	4-14	0.028	-0.138, 0.194
	15+	-0.035	-0.225, 0.156

A change in one headache-day/month was associated with a change of 0.246 productive workdays/3 months.

CONCLUSIONS

Change in the composite LPT measure was linearly related to change in headache-days and accounted for both work loss while employed and transitions in employment status.

Effective use of the optimal acute treatment and advice to use such treatments when pain is mild[5] may yield a potentially valuable return in reduced work impact.

Use of preventive pharmacologic treatments and empirically supported non-pharmacologic interventions among those with a high number of headache-days may offer a valuable return in either maintaining employment status or facilitating a return to work.

It will be important in future studies to examine whether use of acute and preventive agents together either prevent unemployment or increase the likelihood of return to work.

REFERENCES

1. Stewart WF, Wood GC, Razzaghi H, Reed ML, Lipton RB. Work impact of migraine headaches. *J Occup Environ Med*. 2008;50:736-745.
2. Lipton RB, Bigal ME, Diamond M, Freitag F, Reed ML, Stewart WF. Migraine prevalence, disease burden, and the need for preventive therapy. *Neurology*. 2007;68:343-349.
3. Diamond MD, Bigal ME, Silberstein S, Loder E, Reed ML, Lipton RB. Patterns of diagnosis and acute and preventive treatment for migraine in the United States: results of the American Migraine Prevalence and Prevention Study. *Headache*. 2007;47:355-363
4. Stewart WF, Lipton RB, Kolodner KB, Sawyer J, Lee C, Liberman J. Validity of the Migraine Disability Assessment (MIDAS) score in comparison to a diary-based measure in a population sample of migraine sufferers. Pain. 2000; 88(1):41-52
5. D'Amico D, Moschiano F, Usai S, Bussone G. Treatment strategies in the acute therapy of migraine: Stratified care and early intervention. *Neurological Sciences*. 2006;27:S117-22.

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