Gay and Lesbian Experiences of Discrimination, Health, and Well-Being

Surrounding the Presidential Election

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Abstract

Sexual minorities have poorer mental and physical health than heterosexuals; these health disparities are consistently attributed to discrimination. However, the mechanisms linking discrimination with health outcomes remain unclear. This exploratory study examines whether fast-acting mechanisms, like “stressful social environment[s]” contribute to these disparities (minority stress model; Meyer, 2003) by exploiting the unanticipated election of Donald Trump on November 8th, 2016. Gay men and lesbians participated in a ten-day longitudinal daily-diary study, beginning the day before the election (November 7th–16th, 2016).

On the day after the election, participants reported immediate changes in health (e.g., depression, Cohen’s $d=1.33$; illness, 0.44), well-being (e.g., happiness, -0.91), and discrimination (0.45). The immediacy and magnitude of participants’ responses are consistent with the minority stress model. This study provides a window into the experiences of gay men and lesbians, and illustrates how minority stresses, such as political uncertainty and discrimination, may impact vulnerable sexual minorities.

Keywords: Discrimination; Sexual Orientation; American Politics; Health Disparities; Minority Stress Model

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Surrounding the Presidential Election

In the final days leading up the 2016 American presidential election, a victory for the Democratic candidate, Hillary R. Clinton, was nearly certain based on election forecasts (Cook Political Report, 2016; FiveThirtyEight, 2016; Wang, 2016). It was a divisive campaign, unprecedented in many respects. The Republican Party and their candidate, Donald J. Trump, were often criticized by the LGBTQ^a community for their anti-minority rhetoric. Indeed, even the Log Cabin Republicans – the largest coalition of LGBTQ republicans – called their party’s stance “the most anti-LGBT[Q] Platform in the Party’s 162-year history” (Angelo, 2016). Further, their national organization refused to endorse Trump, citing his advisors’ anti-LGBTQ records (Log Cabin Republicans, 2016). Accordingly, LGBTQ individuals voted predominantly for Clinton (Huang, Jacoby, Strickland, & Lai, 2016). After leaving their polling stations on Election Day, those voters may have reasonably expected a Clinton presidency. By late evening on November 8th, 2016, a Trump victory shattered those expectations.

This report presents findings from a short-term daily-diary study on gay men and lesbians that began on November 7th, 2016 – the day before the 2016 United States election. We have two major motives for reporting these findings. First, these data capture the immediate impact of the election on the lived experience of a minority group that stands to lose much under a Trump administration (e.g., marriage equality, workplace discrimination protections). Second, individuals from minority groups, including gay men and lesbians, have poorer health outcomes compared to their heterosexual counterparts (Gonzales, Przedworski, & Henning-Smith, 2016), likely due to stressors associated with their stigmatized status. These stressors include experiences of discrimination and the public’s general prejudice toward their group (Hatzenbuehler, Nolen-Hoeksema, & Dovidio, 2009; Meyer, 2003). Accordingly, we anticipated negative changes across multiple domains of wellness after the election. Thus, we examine the dynamics of these minority stressors within the context of the American political landscape.

^a Lesbian, Gay, Bisexual, Transgender, and Queer

LGBTQ Health Disparities and Potential Causes

Gay men and lesbians report worse mental and physical health compared to general heterosexual populations from Western countries^b (Brennan, Ross, Dobinson, Veldhuizen, & Steele, 2010; Fredriksen-Goldsen et al., 2013; Gonzales et al., 2016; Mayer et al., 2008). Gay men and lesbians are at a greater risk for experiencing psychological disorders (Cochran, Sullivan, & Mays, 2003; Mays & Cochran, 2001), including mood- and anxiety-related disorders, compared to heterosexuals (Bostwick, Boyd, Hughes, & McCabe, 2010). Among adolescents, LGBTQ individuals are more likely to attempt suicide (Hawton, Saunders, & O'Connor, 2012; Russell & Joyner, 2001) than their heterosexual classmates. Furthermore, there is evidence that LGBT individuals are more likely to commit suicide (Gibson, 1989; but see Ryan & Futterman, 1998 for criticisms).

Compared to their heterosexual counterparts, gay men and lesbians also report worse physical health (Gonzales et al., 2016), including being more likely to experience both acute (e.g., headaches, fevers) and chronic health conditions (e.g., high blood pressure; Sandfort, Bakker, Schellevis, & Vanwesenbeeck, 2006). Gay men and lesbians are also at a greater risk of reporting overall physical limitations (Fredriksen-Goldsen et al., 2013). Sexual minorities are at increased risk for experiencing physical violence (McKay, Misra, & Lindquist, 2017). In 2015, 20.1% of hate crimes in the United States were committed against sexual minorities (Federal Bureau of Investigation, 2016), which translates into the highest targeting rate among all minority groups^c. In general, sexual minorities have shorter lifespans (Frisch & Brønnum-Hanse, 2009). Using data from the National Health and Nutrition Examination Survey (1988–1994), the increase in hazard mortality among men who have sex with men was the result of HIV-related mortality (Cochran & Mays, 2011). Other studies however, find that those in same-sex marriages die younger than their married heterosexual counterparts (Frisch & Brønnum-Hanse, 2009), even after excluding AIDS/HIV-related deaths. Moreover, gay men and lesbians had a twelve-year shorter expected lifespan when living in high-

^b We limited our review to 1st world countries because many 2nd and 3rd world countries criminalize/institutionalize non-heterosexuals (e.g., Russia, Iran).

^c Target rate derived by adjusting for population base rates (see Park & Mykhyalshyn, 2016).

stigma areas compared to sexual minorities living in lower-stigma areas (Hatzenbuehler et al., 2014). Such within-group disparities cannot be explained by the HIV/AIDS epidemic alone.

One plausible account of these observed health disparities is the minority stress model (Meyer, 1995). Meyer contends that the health issues disproportionately affecting sexual minorities are a result, in part, of a “hostile and stressful social environment” to which sexual minorities are subjected (Meyer, 2003 p. 674). Although there have been numerous -- albeit gradual -- advances in LGBTQ equality (e.g., *Lawrence v. Texas*, 2003; *Obergefell v. Hodges*, 2015), gay men and lesbians still occupy a stigmatized minority status in the USA (Herek, 2016; Kite & Bryant-Lees, 2016). Socially-patterned differences in stressors explain some of the disparities in distress and anxiety across demographic characteristics (e.g., gender, socioeconomic status, race; Pearlin & Bierman, 2013). Accordingly, stressors associated with belonging to a minority group explain some of the elevated risk of mental and physical health concerns among the sexual minority population (Mays & Cochran, 2001). For example, sexual minorities who frequently experience anti-LGBTQ discrimination report poorer health and well-being than those who experience anti-LGBTQ discrimination infrequently (Swim, Johnston, & Pearson, 2009). Indeed, even the perceptions of others’ stigmatizing attitudes toward sexual minorities is associated with greater psychological distress among gay men and lesbians (Meyer, 1995) and is a risk factor for depression (Lewis, Derlega, Griffin, & Krowinski, 2003). Although evidence supporting the minority stress model is compelling, the question remains whether the ‘stressful social environment’ is the primary mechanism underlying the relationship between discrimination and health, or whether slower-acting mechanisms of discrimination, such as disparities in access to and quality of healthcare, and the broader relationship between health and socioeconomic status (SES; Garrison & Rodgers, 2017; McGarritty & Huebner, 2014) are the primary mechanisms.

Within the healthcare system, discrimination indirectly contributes to sexual minority health disparities (Hsieh & Ruther, 2016). Healthcare providers have implicit preferences for heterosexual patients (Sabin, Riskind, & Nosek, 2015). In some states, those preferences can be explicit by denying care to sexual minorities. For example, in Tennessee, counselors can refuse clients if treatment would “conflict

with the [counselor's] sincerely held principles" (Tennessee SB1556/HB1840, 2016). Eight percent of LGB patients reported being denied care because of their minority status, whereas 27% of transgender patients reported denial of care (Lambda Legal, 2010). Beyond explicit discrimination, there are institutional barriers, such as lesser access to health insurance through one's same-sex spouse (Buchmueller & Carpenter, 2010).^d Thus, discriminatory policies and treatment may contribute to disparities between heterosexual and sexual minority patients.

LGBTQ health disparities may also illustrate a more general association between poverty and health. Although some studies find that LGBTQ individuals are more educated than their heterosexual peers (Fine, 2014; Gates, 2010; but see Gates & Newport, 2012), they report lower incomes than heterosexuals in the same occupation (Waite & Denier, 2015) and are at greater risk of living in poverty (Badgett, Durso, & Schneebaum, 2013). Potentially, the stressors associated with poverty (Baum et al., 1999; McEwen & Stellar, 1993) rather than with direct discrimination may explain a portion of LGBTQ health disparities. Indeed, SES moderates the relationship between sexual minority status and health (McGarritty & Huebner, 2014); however, the health disparity remains, even after controlling for multiple components of SES (e.g., Bostwick et al., 2010; Gonzales et al., 2016). Rather than moderating the relationship between sexual minority status and health, SES could be indirectly mediating the relationship between LGBTQ discrimination and health. Approximately, 10% of LGB individuals report being denied a promotion or being fired due to anti-LGBTQ sentiments (Badgett, Lau, Sears, & Ho, 2007). Thus, the economic consequences of discrimination could result in decreased health through the stressors of poverty. These additional frameworks still contend that LGBTQ health disparities arise from discrimination, but act through different pathways – augmenting the minority stress model rather than merely replacing it.

Part of the challenge with untangling these additional explanations is that much of the LGBTQ health disparities literature is cross-sectional and observational in design (e.g., Bostwick et al., 2010; Gonzales et al., 2016; but see Cochran & Mays, 2011 and Mohr & Sarno, 2016). Accordingly, a study with a

^d Health insurance disparity may change because of recent court rulings (e.g., Obergefell v. Hodges, 2015)

temporal component would facilitate testing whether faster-acting minority stressors, like increased discrimination, are associated with poorer health and well-being. The current study employs such a design by exploiting a broadly unanticipated event: the election of Donald Trump on November 8th, 2016.

Under the minority stress model, we would expect an immediate change in health status following the election result. In contrast, we would not expect an immediate effect on health if the major mechanism of action was discrimination through access to healthcare or through increased economic hardship. Those mechanisms are slower-acting, and would show an impact in the longer term, but not during this brief study window. Thus, immediate changes in health status would provide explicit support for the faster-acting minority stressors under the minority stress model, whereas null results would provide implicit support of slower-acting mechanisms. Although this study is explicitly exploratory in nature because we did not anticipate the outcome of the 2016 presidential election, the findings are nonetheless informative and meaningful.

Method

Data

Original Study. Data used in this paper are from part of a series of dissertation studies (Doane, 2017). The dissertation examined the role of visible sexual minority status in shaping processes related to stress, coping, and ultimately health. Although sexual orientation is typically considered a concealable identity (i.e., one that can be hidden from others), visible gender-nonconforming behaviors and physical characteristics are associated with sexual orientation (Rieger, Linsenmeier, Gygax, & Bailey, 2008). Accordingly, sexual minorities who are more visible (e.g., effeminate gay men) are at greater risk of experiencing stigma and discrimination (Baams et al., 2013). Thus, subjects were purposefully selected on extreme scores of a gender-nonconformity index. The specific dissertation study found that gender-nonconformity was indirectly associated with compromised mental and physical health via experiences of discrimination (See Doane, 2017 Study 2 for additional information).

The University of Nevada, Reno Social Behavioral Institutional Review Board approved the study on October 26th, 2016; on November 7th, willing participants started this survey and were asked to complete one survey per day for 10 days. Participants were emailed a survey link daily at 6:00 pm (Mountain Standard Time) that remained active until 11:59 pm (participants' local time).

Sampling Procedure. Sample size was determined by convention. Specifically, previous studies with similar research goals, methods, populations, and models have included relatively few participants (e.g., 50 participants, Hatzenbuehler et al., 2009; 61 participants, Mohr & Sarno, 2016). Although this number is smaller than found in typical cross-sectional surveys, each participant completes several surveys. Consistent with previous work, we targeted sample sizes of 60 participants per condition: sexual orientation (gay men versus lesbians) and gender-nonconformity (high versus low). We adjusted this number ($n=240$) by an expected 40% response rate.

Accordingly, six-hundred gay men and lesbians were identified from a larger convenience sample ($n=2,475$), recruited from community organizations and social media (See Doane, 2017). Selected subjects had extreme (high or low) scores on the gender-nonconformity index. Initially, 388 responded to the email invitation, while 16 people had e-mails that “bounced back” (i.e., non-working e-mails).

Subject Characteristics. Of the 377 subjects who agreed to participate in the study, 276 provided at least one day of useable responses (1,184 observations). The 47% response rate was higher than typical email response-rates (20%; Shih & Fan, 2009), but the degree of missing survey days was greater than typical for daily-diary studies (e.g., 15%; Mohr & Sarno, 2016). Respondents averaged 4.29 survey days (range[1, 10]), and ranged in age from 18 to 75 (mean 36.4 years, SD 14.6). Subjects identified as lesbians (47.8%) or gay men (52.2%). Fifty-four percent reported their sex as male; 44.9% female; and 2 intersex. Subjects were predominantly Caucasian (79.3%), 7.2% Multiracial, 2.5% Black, 5.8% Asian, and 5% “Other” racial identities. All respondents lived in the USA: 19.2% Northeast; 15.2% Midwest; 28.3% South; and 37.3% West. Respondents were more educated than typical LGBTQ populations; 77% had a 4-year degree or higher. However, respondents were more typical in socioeconomic origin: 12.3% from lower and

working class; 36.2% lower-middle class; 49.3% upper-middle class; and 1.8% upper class. Non-responders (n=100) were significantly older (mean 40 years, $p=.046$). Responders who completed fewer survey days (<5) had higher levels of physical illness and experienced more discrimination compared to subjects who persisted. Accordingly, we believe that our findings may be underestimates owing to selective attrition.

Measures

Raw-score means with standard deviations by day are presented in Table 1. Internal consistencies were measured using Omega (Ω ; Zinbarg, Yovel, Revelle, & McDonald, 2006). Median Omega values with interquartile ranges are included for measures assessed repeatedly (See Table 1).

Anxiety and Depression. Participants completed a six-item scale of anxiety and eight-item scale of depression from the Short Form of the Profile of Mood States (POMS-SF; Shacham, 1983). On a 5-point scale ('not at all' to 'extremely'), participants reported how they felt on numerous anxiety-related (e.g., 'tense') or depression-related adjectives (e.g., 'sad').

Discrimination. Participants reported daily experiences of discrimination with a 10-item scale (Williams et al., 2008). The scale was modified to focus on experiences of discrimination due to participants' sexual minority status. Participants indicated how often (1 'never' to 5 'a great deal'), they experienced various discriminatory events (e.g., anti-gay remarks).

Happiness. Participants completed the following two-item assessment of happiness: "How happy would you say you are today?" and "All things considered, how satisfied are you with your life as a whole today?" on a 10-point scale ('not at all' to 'completely').

Identity Concealment. The six-item Sexual Orientation Concealment Scale (Blair, 2006) assessed how often participants kept their minority identities hidden from others that day (e.g., 'I concealed my sexual orientation by telling someone that I was straight'; 1 'not at all' to 5 'all the time').

Loneliness. The four-item social isolation short-scale of the PROMIS (Cella et al., 2007; Cella et al., 2010) was adapted to reflect daily experiences of loneliness and isolation (e.g., ‘I felt left out today’; 1 ‘never’ to 5 ‘always’).

Physical health. Participants completed one item on their daily physical health status from the Short-Form 36-Item Health Status Questionnaire (Ware & Sherbourne, 1992). On a 5-point scale (‘poor’ to ‘excellent’), participants answered: “Today, how did you feel physically?”

Physical illness symptoms. The Physical Symptoms Inventory (PSI; Spector & Jex, 1998) measured participants’ experiences of 13 ill-health symptoms. Participants reported how frequently they experienced symptoms such as “upset stomach” (1 ‘none of the time’ to 5 ‘all of the time’). The PSI aggregates ratings across symptoms.

Positive and negative affect. Participants answered a 10-item version of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) on how frequently they experienced negative (e.g., ‘upset’) and positive emotions (e.g., ‘determined’) on a 5-point scale (‘very slightly/not at all’ to ‘extremely’).

Self-Esteem. Participants indicated their agreement (1 ‘Strongly Disagree’ to 5 ‘Strongly Agree’) with the statement ‘I have high self-esteem’.

Sense of Purpose and Control. Participants indicated their level of agreement (1 ‘Strongly Disagree’ to 5 ‘Strongly Agree’) on 8 items for Sense of Control (Mirowsky & Ross, 1991; e.g., ‘I felt I was pushed around today’), and 2 items for Sense of Purpose from the Daily Meaning Scale (Steger, Kashdan, & Oishi, 2008; e.g., ‘How much do you feel your life had purpose’), and were rated on a 7-point scale (‘Not at all’ to ‘Absolutely’).

Sleep Quality. Sleep quality was measured using the 3-item sleep disturbance short-scale of the PROMIS (Cella et al., 2010; e.g., ‘I felt fatigued today’) on a five-point scale (‘Strongly Disagree’ to ‘Strongly Agree’).

Stress. Participants completed the four-item Perceived Stress Scale (PSS; Cohen et al., 1983) on how frequently they felt overburdened and stressed (1 ‘never’ to 5 ‘very often’), and an additional face-valid item: “How stressed did you feel today” (1 ‘not at all stressed’ to 5 ‘extremely stressed’).

Gender-nonconformity index. On day one, seven items assessed the degree to which participants reported having visible gendered characteristics (adapted from Martin-Storey & August, 2016; described in Doane, 2017). Items were deliberately selected for uncontrollable characteristics – i.e., items related to controllable characteristics or cultural markers of sexual orientation were excluded (e.g., gender-atypical expressions through clothing). Participants responded in terms of feminine to masculine (1 ‘very feminine’ to 7 ‘very masculine’), such as ‘How feminine or masculine are you?’. See Table S1.1 in the online supplemental materials (SM) for full list.

The index was scored so high gender-nonconformity indicated higher scores. In this sample, the index’s test-retest reliability was stable ($r_{\alpha}=0.95$; 95% CI[0.94. 0.97]; $n=161$), over six months. We expected this index to be negatively associated with baseline well-being levels.

Table 1 Descriptive Statistics by Day

	Mean (SD) Day 1	2	3	4	5	6	7	8	9	10	Median Ω (IQR) Across Days
Anxiety	2.14 (0.96)	2.36 (1.08)	3.18 (1.23)	2.39 (1.18)	2.11 (1.03)	1.83 (0.93)	1.77 (0.89)	1.87 (0.95)	1.75 (0.77)	1.85 (0.90)	0.97 (0.01)
Depression	1.63 (0.82)	1.72 (0.91)	2.97 (1.17)	2.10 (1.05)	1.83 (0.85)	1.52 (0.67)	1.58 (0.75)	1.64 (0.82)	1.49 (0.67)	1.48 (0.70)	0.96 (0.01)
Discrimination	1.41 (0.65)	1.27 (0.52)	1.43 (0.62)	1.28 (0.54)	1.19 (0.34)	1.20 (0.41)	1.20 (0.48)	1.16 (0.40)	1.15 (0.37)	1.09 (0.20)	0.95 (0.03)
Gender Non-Conformity Index	3.13 (1.53)										0.98 (<i>na</i>)
Happiness	6.83 (1.84)	6.54 (2.01)	4.82 (2.39)	6.28 (1.97)	6.61 (1.76)	7.19 (1.87)	7.06 (1.98)	6.78 (1.98)	7.08 (1.70)	7.15 (1.88)	0.89 (0.07)
Identity Concealment	1.37 (0.70)	1.39 (0.63)	1.36 (0.66)	1.28 (0.57)	1.24 (0.53)	1.23 (0.56)	1.26 (0.59)	1.23 (0.53)	1.19 (0.52)	1.16 (0.39)	0.93 (0.02)
Loneliness	1.87 (0.97)	1.87 (1.03)	2.23 (1.18)	1.84 (0.91)	1.81 (0.87)	1.61 (0.78)	1.68 (0.96)	1.67 (0.78)	1.62 (0.79)	1.59 (0.79)	0.94 (0.02)
Negative Affect	1.70 (0.68)	1.87 (0.84)	2.91 (1.00)	2.15 (0.97)	1.83 (0.81)	1.65 (0.73)	1.56 (0.71)	1.56 (0.67)	1.48 (0.58)	1.58 (0.70)	0.86 (0.04)
Physical Health	2.97 (1.01)	3.11 (0.99)	2.70 (1.14)	3.17 (1.06)	3.04 (0.97)	3.27 (1.00)	3.3 (1.11)	3.04 (1.12)	3.24 (1.06)	3.20 (1.04)	<i>na</i>
Physical Illness	1.54 (0.48)	1.44 (0.41)	1.60 (0.48)	1.42 (0.44)	1.42 (0.41)	1.37 (0.38)	1.36 (0.38)	1.40 (0.42)	1.34 (0.31)	1.41 (0.47)	0.81 (0.04)
Positive Affect	3.16 (0.91)	3.04 (0.94)	2.79 (0.96)	2.89 (1.00)	2.72 (1.00)	2.78 (1.05)	2.78 (1.08)	2.65 (0.98)	2.71 (1.01)	2.76 (1.02)	0.91 (0.03)
Self-Esteem	3.47 (1.11)	3.55 (1.14)	3.50 (1.18)	3.62 (1.14)	3.72 (1.04)	3.76 (1.12)	3.76 (1.13)	3.70 (1.16)	3.72 (1.04)	3.71 (1.06)	<i>na</i>
Sense of Control	4.05 (0.83)	3.88 (1.01)	3.13 (1.36)	3.76 (1.10)	3.94 (0.93)	4.13 (0.86)	4.18 (0.82)	4.08 (0.96)	4.15 (0.80)	4.12 (0.85)	0.93 (0.02)
Sense of Purpose	4.98 (1.54)	4.97 (1.46)	4.60 (1.82)	4.94 (1.53)	4.86 (1.38)	5.12 (1.46)	4.97 (1.65)	4.95 (1.58)	5.20 (1.29)	5.13 (1.50)	0.95 (0.02)
Sleep Quality	3.80 (1.08)	3.89 (1.03)	3.18 (1.33)	3.80 (1.13)	3.87 (1.11)	4.11 (0.92)	4.00 (1.15)	3.81 (1.17)	4.00 (1.06)	4.06 (1.09)	0.92 (0.01)
Stress	2.36 (0.81)	2.42 (0.78)	2.93 (0.90)	2.53 (0.87)	2.40 (0.78)	2.27 (0.80)	2.27 (0.78)	2.29 (0.87)	2.21 (0.69)	2.19 (0.77)	0.89 (0.03)

Notes: Mean (SD); Ω =Omega; IQR=Interquartile Range; *na*=not applicable

Analyses

Statistical and graphical analyses are exploratory. Loess curves, a localized non-parametric regression smoothing technique, only include subjects with more than 5 survey days to reduce the attrition's influence. Because daily responses are nested within individuals, analyses were performed using multilevel models (i.e., linear mixed effects) in R version 3.4.1 with the lme4 library (Bates, Mächler, Bolker, & Walker, 2015). Model specifications are in Section S2 of the online SM; R syntax for generating analyses and figures are in the online Supplemental Code. Missingness was addressed with residual maximum likelihood estimation (REML). Specifically, we tested whether responses on the day after the election (November 9th) differed meaningfully from all other days.

Ideally, we would have decomposed the reaction by comparing responses to a pre-election baseline, but data limitations restricted us in doing so. We present our results using two methods of variable centering to provide greater context. Specifically, all variables were group-mean centered without standardizing, as well grand-mean centered and standardized (mean=0, SD=1). In the former case, beta coefficients reflect average raw-score deviations for each person. In the latter case, beta coefficients can be interpreted like Cohen's d, indicating changes in overall levels of each construct.

Results

We present our findings on gay and lesbian reactions during the 2016 presidential election graphically and empirically. Figures 1 and 2 display within-person trends with individual spaghetti plots and between-person trends with Loess curves and 95% confidence intervals. Plotted variables are untransformed to highlight raw-score changes. Days since the election was measured continuously using survey completion timestamps. In Figure 1, marked spikes in negative affect and anxiety occurred on the day after the election; in Figure 2, more subtle trends show smaller spikes in experienced discrimination and illness.

Figure 1 Changes in Negative Affect and Anxiety among Gay Men and Lesbians during the 2016 USA Presidential Election

Figure 2 Changes in Discrimination and Physical Illness among Gay men and Lesbians during the 2016 USA Presidential Election

Linear mixed effects models test how individuals responded after the election. Although we were primarily interested in within-person changes (fixed effects), we also tested whether there were between-person responses (i.e., did individuals differ in their baseline levels, random intercept; and did individuals differ in the magnitude of their response, random slope).

Overall, there was significant within- and between-person variability on the day after the election (see Tables 2 and 3). Table 2 presents the analyses using group-mean centering, whereas Table 3 presents the same analyses using grand-mean centering and are standardized (mean=0, SD=1). For example, there was a 0.19 raw-score increase in experienced discrimination for each person on the day after the election ($p<.001$), relative to all other days. The overall model-implied increase in standard-deviation units was 0.45. Using Cohen's (1988) benchmarks, this effect was medium-sized. Further, there was meaningful variability in average level of discrimination experienced (raw-score ICC=.82) and change in discrimination (raw-score variance=0.12, $p<.001$).

Table 2 Linear mixed effects model results: Group-Mean Centered

Measure	Fixed Effects										Random Effects				
	Intercept	SE	t	p	95% CI	Day after Election	SE	t	p	95% CI	Intercept	Slope	Residual	obs (subjects)	ICC
Anxiety	-0.29	0.04	8.01	<.001	[-0.36, -0.22]	1.04	0.09	11.06	<.001	[0.86,1.22]	0.17	0.53	0.44	1092(247)	0.28
Depression	-0.47	0.04	12.42	<.001	[-0.55, -0.40]	1.22	0.09	13.14	<.001	[1.04,1.41]	0.23	0.64	0.34	1092(247)	0.40
Discrimination	-0.61	0.05	12.12	<.001	[-0.71, -0.51]	0.19	0.05	3.91	<.001	[0.09,0.28]	0.59	0.12	0.13	1137(268)	0.82
Happiness	2.44	0.13	18.20	<.001	[2.18, 2.71]	-1.80	0.18	10.16	<.001	[-2.15, -1.45]	3.97	2.13	1.21	1107(254)	0.77
Identity Concealment	-0.60	0.05	10.92	<.001	[-0.70, -0.49]	0.08	0.03	2.54	0.011	[0.02,0.14]	0.72	<i>ns</i>	0.10	1123(262)	0.88
Loneliness	-0.39	0.04	8.89	<.001	[-0.48, -0.31]	0.48	0.08	5.90	<.001	[0.32,0.65]	0.37	0.45	0.30	1107(254)	0.55
Negative Affect	-0.45	0.04	11.73	<.001	[-0.52, -0.37]	1.14	0.07	15.42	<.001	[0.99,1.28]	0.24	0.26	0.31	1098(250)	0.44
Physical Health	0.40	0.08	5.37	<.001	[0.26, 0.55]	-0.38	0.09	4.30	<.001	[-0.55, -0.21]	1.19	0.32	0.43	1059(244)	0.74
Physical Illness	-0.52	0.05	11.44	<.001	[-0.61, -0.43]	0.19	0.04	5.41	<.001	[0.12,0.26]	0.48	0.08	0.05	1077(241)	0.90
Positive Affect	0.23	0.06	3.64	<.001	[0.10, 0.35]	-0.04	0.07	0.58	0.559	[-0.17,0.09]	0.80	<i>ns</i>	0.39	1098(250)	0.67
Self-Esteem	0.65	0.08	8.28	<.001	[0.49, 0.80]	-0.07	0.06	1.07	0.287	[-0.19,0.06]	1.40	0.15	0.24	1093(252)	0.86
Sense of Control	0.89	0.08	11.38	<.001	[0.73, 1.04]	-0.90	0.10	8.91	<.001	[-1.09, -0.7]	1.34	0.68	0.36	1095(252)	0.79
Sense of Purpose	1.39	0.10	14.54	<.001	[1.21, 1.58]	-0.35	0.10	3.48	0.001	[-0.55, -0.15]	2.11	0.63	0.42	1107(254)	0.83
Sleep Quality	0.81	0.08	10.00	<.001	[0.65, 0.97]	-0.67	0.11	6.28	<.001	[-0.89, -0.46]	1.38	0.63	0.54	1082(244)	0.72
Stress	-0.05	0.03	1.45	0.148	[-0.11, 0.02]	0.58	0.06	10.20	<.001	[0.47, 0.69]	0.20	0.13	0.19	1096(250)	0.51

Notes: Obs=Observation; ICC=Intraclass Correlation Coefficient; ns=not significant

Table 3 Linear mixed effects model results: Grand-Mean Centered and Standardized

Measure	Fixed Effects					Random Effects									
	Intercept	SE	t	p	95% CI	Day after Election	SE	t	p	95% CI	Intercept	Slope	Residual	obs(subjects)	ICC
Anxiety	-0.01	0.05	0.19	0.850	[-0.11, 0.09]	1.00	0.09	11.22	<.001	[0.83, 1.18]	0.52	0.42	0.38	1092(247)	0.58
Depression	-0.07	0.05	1.47	0.142	[-0.17, 0.02]	1.33	0.10	13.33	<.001	[1.13, 1.52]	0.43	0.64	0.38	1092(247)	0.53
Discrimination	0.12	0.05	2.29	0.023	[0.02, 0.23]	0.45	0.10	4.60	<.001	[0.26, 0.64]	0.56	0.45	0.52	1137(268)	0.52
Happiness	0.03	0.05	0.52	0.601	[-0.08, 0.13]	-0.91	0.09	10.53	<.001	[-1.08, -0.74]	0.58	0.50	0.29	1107(254)	0.67
Identity Concealment	0.12	0.06	1.92	0.056	[0.00, 0.25]	0.20	0.06	3.36	0.001	[0.08, 0.31]	0.95	0.10	0.27	1123(262)	0.78
Loneliness	0.04	0.06	0.71	0.477	[-0.07, 0.15]	0.55	0.09	6.15	<.001	[0.37, 0.72]	0.66	0.48	0.34	1107(254)	0.66
Negative Affect	-0.08	0.05	1.60	0.112	[-0.17, 0.02]	1.33	0.09	15.46	<.001	[1.16, 1.50]	0.40	0.33	0.41	1098(250)	0.50
Physical Health	-0.02	0.05	0.44	0.663	[-0.13, 0.08]	-0.38	0.08	4.65	<.001	[-0.55, -0.22]	0.55	0.28	0.38	1059(244)	0.59
Physical Illness	0.14	0.07	2.15	0.033	[0.01, 0.28]	0.44	0.08	5.32	<.001	[0.28, 0.60]	0.96	0.41	0.28	1077(241)	0.77
Positive Affect	0.07	0.05	1.24	0.215	[-0.04, 0.17]	-0.05	0.07	0.84	0.403	[-0.18, 0.07]	0.57	<i>ns</i>	0.40	1098(250)	0.59
Self-Esteem	-0.04	0.06	0.75	0.456	[-0.16, 0.07]	-0.08	0.06	1.35	0.18	[-0.19, 0.03]	0.83	0.12	0.19	1093(252)	0.81
Sense of Control	0.02	0.05	0.44	0.660	[-0.08, 0.12]	-0.93	0.10	9.32	<.001	[-1.13, -0.74]	0.51	0.68	0.35	1095(252)	0.59
Sense of Purpose	0.01	0.06	0.21	0.834	[-0.10, 0.13]	-0.21	0.07	3.19	0.002	[-0.35, -0.08]	0.77	0.28	0.18	1107(254)	0.81
Sleep Quality	-0.05	0.05	0.84	0.403	[-0.15, 0.06]	-0.62	0.09	6.60	<.001	[-0.81, -0.44]	0.54	0.47	0.42	1082(244)	0.56
Stress	0.04	0.06	0.67	0.505	[-0.07, 0.15]	0.71	0.07	10.24	<.001	[0.57, 0.84]	0.65	0.18	0.29	1096(250)	0.69

Notes: Obs=Observation; ICC=Intraclass Correlation Coefficient; ns=not significant

Briefly, we list observed effects, noting raw-score change, effect size, and direction. (Very) large effects (i.e., “about as high as they come”; Cohen, 1988): depression (raw $\beta=1.22$; standardized $\beta=1.33$), negative affect (1.14; 1.33), anxiety (1.04; 1.00), sense of control (-0.90; -0.93), and happiness (-1.80; -0.91). Medium effects (i.e., “large enough to be visible to the naked eye”): stress (0.58; 0.71), sleep quality (-0.67; -0.62), loneliness (0.48; 0.55), and discrimination (0.19; 0.45). Small effects: physical illness (0.19; 0.44), physical health (-0.38; -0.38), sense of purpose (-0.35; -0.21), and identity concealment (0.08; 0.20). There were no significant changes in self-esteem or positive affect. Paired t-tests gave similar results (Tables S2 and S3 in SM).

Effects of Selection. Because subjects were selected for gender-nonconformity (or lack thereof), we have included post-hoc (i.e., exploratory) moderator analyses to examine selection effects (see Table S4 in SM). Subjects were classified into high nonconformity and low nonconformity groups. Consistent with the literature, we found significant main effects for nonconformity across most constructs; high-nonconformity participants were less happy, had poorer health, lower positive affect, lower self-esteem, felt less in control, less sense of purpose, and poorer sleep. Interactions between day-after-election and nonconformity status were not significant. In general, these selection analyses should be interpreted conservatively because cross-level interactions are generally underpowered (Mathieu et al., 2012).

Effects over Time. We included additional exploratory tests of change over the ten-day period, beyond day-after effects. Specifically, we tested linear, quadratic, cubic, and quartic trajectories, using nested-model comparisons and an approach adapted from Iida, Shrout, Laurenceau, and Bolger (2012). All models were significantly improved by adding linear terms, indicating at least linear trends (see Table S5.4). For many variables, the best-fitting model was higher ordered: quadratic (discrimination, identity concealment, loneliness, physical illness, positive affect, self-esteem), cubic (depression, negative affect), or quartic (stress). Still, a significant day-after-the-election effect remained across measures, except for self-esteem and identity concealment. The average absolute difference between the time-varying model day-after-the-election effect and the original estimate (Table 2) was relatively small (0.087 raw-score units).

Although the null result for self-esteem was expected, non-significant results for identity concealment suggest that changes in concealing behavior was not a specific day-after-the-election effect, but rather indicated heightened concealment during the early days (1-3), with a gradual decline afterwards. (See Table S5.6 for daily net effects.) Section S5 of SM details these analyses.

Discussion

Although the study was not initially designed to observe how gay men and lesbians responded during the 2016 United States election, it was repurposed to do so. On the day after the election, our participants' responses were consistent, immediate, and substantial. Within- and between-person responses after the presidential election converged, suggesting a large, negative, and immediate response across health and well-being measures. Participants' responses are consistent with the minority stress model, where even the threat of discrimination negatively impacts health and well-being. These findings provide explicit support for faster-acting mechanisms (e.g., environmental stressors). While this study is not experimental in nature, the effect sizes involved are unprecedentedly large, and are likely attributable to the stressors and uncertainty associated with the election. Accordingly, we are hard-pressed to identify plausible alternative causes associated with large effect sizes that impacted gay men and lesbians across the country, upon a variety of domains. Still, for individual variables, alternative explanations cannot entirely be eliminated. For example, poor sleep may have resulted from staying up late to watch the election results.

Regardless, this study provides a window into the experiences of gay men and lesbians. It potentially illustrates how minority stressors, such as political uncertainty and discrimination, impact vulnerable sexual minorities. However, it is not clear whether this narrative holds for the broader LGBTQ community, or other vulnerable minority groups or simply for individuals who were disappointed by the election result. In our study, gay men and lesbians were explicitly selected for either being highly gender-nonconforming or being highly gender-conforming. High-nonconforming participants had lower baseline health and wellbeing, but their responses to the election did not differ from their gender-conforming peers.

Our sample was more educated and affluent than general LGBTQ populations, which might have a protective effect (McGarrity & Huebner, 2014). Accordingly, in more representative samples, we would expect either larger effects or slower adaptation. However, preliminary analyses of LGB participants ($n=226$) from the 2016 American National Election Time Series Study find no association between post-election anxiety and education ($r=.01$) or income ($r=-.05$). Lastly, our sample was exclusively homosexual, and had few transgender persons; so, we do not know whether individuals with other sexual orientations or gender identities experienced lesser (or greater) effects.

Other election data from LGBTQ samples include bisexual persons. For example, Gallup compared pre-election samples of LGBT Americans to other post-election LGBT samples (Gates, 2016). They report a 10-point reduction in LGBT Americans classified as ‘thriving’ and a 2-point reduction in non-LGBT Americans, from sometime during month before the election (Oct 1-Nov 8) to sometime after the election (Nov 9-Dec 6). Given how the pre- and post-election periods are aggregated, we cannot examine whether post-election LGBT Americans uniformly experienced declines in ‘thriving’ or those surveyed later had adapted to the election outcome. In our sample, it appears that the average subject recovered to baseline levels within a few days, but variability in recovery time was considerable (see Lucas, 2007 for more on adaptation to life events). Moreover, because we had limited pre-election data, we cannot untangle whether subjects fully adapted and returned to their baseline levels before the entire election campaign, or whether this adaptation reflects a lowered baseline. In the latter case, the lowered baseline could reflect a gradual decline as the threat of an anti-LGBTQ president grew more salient.

Limitations and Generalization.

Although our sample had a greater survey response rate than typical psychology studies, we had more missing data than typical in daily-diary studies (e.g., 15%, Mohr & Sarno, 2016). We believe the greater level of dropout occurred because (1) participants were not paid for participation in this specific wave of data,^e whereas Mohr and Sarno (2016) conditioned compensation eligibility upon 70% completion;

^e Participants were eligible for unconditional compensation in the initial convenience sample (see Doane, 2017).

and (2) that week was an especially tumultuous for LGBTQ Americans. During the week after the election, Southern Poverty Law (SPL; 2016) reported a spike in hate crimes, including anti-LGBTQ crimes. In our sample, subjects were more likely to drop out of the study after experiencing high levels of discrimination or illness. Thus, those participants who potentially had the greatest responses throughout the election were more likely to be missing. Accordingly, we believe that our results may underestimate the observed effects. Consequently, baseline levels by end of study are hard to interpret. Selective attrition may masquerade as adaptation because subjects with more post-election consequences dropped out.

Certainly, LGBTQ community were not the only group to experience negative reactions during the election. Democrats also declined in 'thriving' after the election (Gates, 2016), but diagnoses of depression in Democratic districts did not significantly differ from Republican districts after the election (Jena et al., 2017). Concerning other vulnerable minority groups, Muslim-Americans had 90% voter turnout (Council on American-Islamic Relations, 2016), and 87% voted for non-Trump candidates (74% for Clinton). They also experienced a spike in hate crimes in the week after the election (SPL, 2016). However, we do not know whether the parallels between LGBTQ Americans and Muslim Americans extend to post-election health effects because our study lacked comparison groups. Accordingly, we do not know whether the observed effects are vulnerable-minority group effects or LGBTQ-specific effects.

As more studies are published, we will gain a better sense of minority (and majority) experiences during the election. In the shorter term, the field can decompose election experiences into numerous group-specific effects (political, LGBTQ, etc). In the longer term, additional work can examine whether there are increased rates of economic hardship or greater disparities in healthcare access among LGBTQ individuals and other minority groups.

Final Remarks

Although our study provides a window into the lives of LGBTQ Americans for one event, they reflect a broader issue. Health disparities arise from accumulated stresses, not single events. Early actions by Trump and his administration indicate longer-term policy changes (Battle & Wheeler, 2017; Posner, 2017; Trump, 2017a, 2017b, 2017c; Zarda v. Altitude Express, 2017). These changes will likely harm the LGBTQ community, both through the policies themselves and the minority stresses they create. We believe the health gap between sexual minorities and non-minorities will persist until LGBTQ individuals have equal rights to their heterosexual counterparts.

References

- The American National Election Studies (2017). The ANES guide to public opinion and electoral behavior. Retrieved from www.electionstudies.org/nesguide/nesguide.htm
- Angelo, G. T. (2016). A message on the GOP platform from Log Cabin Republicans President Gregory T. Angelo. Retrieved from www.logcabin.org/pressrelease/log-cabin-republicans-pac-statement-on-presidential-endorsement-decision/.
- Badgett, M. V., Lau, H., Sears, B., & Ho, D. (2007). Bias in the workplace: Consistent evidence of sexual orientation and gender identity discrimination. The Williams Institute, University of California Los Angeles.
- Badgett, M. V. L., Durso, L. E., & Schneebaum, A. (2013). New patterns of poverty in the lesbian, gay, and bisexual community. The Williams Institute, University of California Los Angeles. Retrieved from <http://williamsinstitute.law.ucla.edu/wp-content/uploads/LGB-Poverty-Update-Jun-2013.pdf>.
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1-48. doi:10.18637/jss.v067.i01.
- Battle, S., & Wheeler, T. (2017). Dear colleague letter. Washington, DC: U.S. Department of Education; U.S. Department of Justice. Retrieved from <http://www2.ed.gov/about/offices/list/ocr/letters/colleague-201702-title-ix.docx>.
- Baum, A., Garofalo, J. P., & Yali, A. M. (1999). Socioeconomic status and chronic stress: Does stress account for SES effects on health? *Annals of the New York Academy of Sciences*, 896(1), 131-144. doi:10.1111/j.1749-6632.1999.tb08111.x.
- Blair, A. D. (2006). Development of a sexual orientation concealment scale. Retrieved from ProQuest Digital Dissertations.
- Bostwick, W. B., Boyd, C. J., Hughes, T. L., & McCabe, S. E. (2010). Dimensions of sexual orientation and the prevalence of mood and anxiety disorders in the United States. *American Journal of Public Health*, 100(3), 468-475. doi:10.2105/AJPH.2008.152942.
- Brief for the United States as amici curiae supporting defendants, Zarda et al. v. Altitude Express, No. 15-3775 (Court of Appeals, 2d Cir., July 26, 2017), retrieved from https://www.lambdalegal.org/in-court/legal-docs/ny_zarda_20170726_doj-amicus-brief
- Brennan, D. J., Ross, L. E., Dobinson, C., Veldhuizen, S., & Steele, L. S. (2010). Men's sexual orientation and health in Canada. *Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique*, 101(3), 255-258. doi:10.17269/cjph.101.2361

- Buchmueller, T., & Carpenter, C. S. (2010). Disparities in health insurance coverage, access, and outcomes for individuals in same-sex versus different-sex relationships, 2000–2007. *American Journal of Public Health, 100*(3), 489–495. doi:10.2105/AJPH.2009.160804.
- Cella, D., Riley, W., Stone, A., Rothrock, N., Reeve, B., Yount, S., . . . Choi, S. (2010). Initial adult health item banks and first wave testing of the Patient-Reported Outcomes Measurement Information System (PROMIS) Network: 2005–2008. *Journal of Clinical Epidemiology, 63*(11), 1179–1194. doi:10.1016/j.jclinepi.2010.04.011.
- Cella, D., Yount, S., Rothrock, N., Gershon, R., Cook, K., Reeve, B., . . . Rose, M. (2007). The Patient-Reported Outcomes Measurement Information System (PROMIS): Progress of an NIH Roadmap cooperative group during its first two years. *Medical Care, 45*(5 Suppl 1), S3–S11. doi:10.1097/01.mlr.0000258615.42478.55.
- Cochran, S. D., & Mays, V. M. (2011). Sexual orientation and mortality among US men aged 17 to 59 years: Results from the National Health and Nutrition Examination Survey III. *American Journal of Public Health, 101*(6), 1133–1138. doi:10.2105/AJPH.2010.300013.
- Cochran, S. D., Sullivan, J. G., & Mays, V. M. (2003). Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *Journal of Consulting and Clinical Psychology, 71*(1), 53–61. doi:10.1037/0022-006X.71.1.53.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385–396. doi:10.2307/2136404.
- Cook Political Report (2016). 2016 electoral scorecard for November 7, 2016. Retrieved from <http://cookpolitical.com/presidential/charts/scorecard>.
- Council on American-Islamic Relations (2016). For the record: CAIR releases results of presidential election exit poll. Retrieved from <https://www.cair.com/press-center/press-releases/13909-for-the-record-cair-releases-results-of-presidential-election-exit-poll.html>.
- Doane, M. (2017). The role of stigma visibility on stigma-related stress, coping, and health: An exploration among gay men and lesbians. Retrieved from ProQuest Digital Dissertations.
- Federal Bureau of Investigation, United States Department of Justice. (2016). Uniform crime report: Hate crime statistics, 2015: Victims. Retrieved from https://ucr.fbi.gov/hate-crime/2015/topic-pages/victims_final.
- Fine, L. E. (2014). Penalized or privileged?: Sexual identity, gender, and postsecondary educational attainment. *American Journal of Education, 121*(2), 271–297. doi:10.1086/679393.

- FiveThirtyEight (2016). 2016 election forecast. Retrieved from FiveThirtyEight: <https://projects.fivethirtyeight.com/2016-election-forecast/>.
- Fredriksen-Goldsen, K. I., Kim, H. J., Barkan, S. E., Muraco, A., & Hoy-Ellis, C. P. (2013). Health disparities among lesbian, gay, and bisexual older adults: Results from a population-based study. *American Journal of Public Health, 103*(10), 1802-1809. doi:10.2105/AJPH.2012.301110.
- Frisch, M., & Brønnum-Hansen, H. (2009). Mortality among men and women in same-sex marriage: A national cohort study of 8333 Danes. *American Journal of Public Health, 99*(1), 133-137. doi:10.2105/AJPH.2008.133801.
- Gable, S. L., Reis, H. T., & Elliot, A. J. (2000). Behavioral activation and inhibition in everyday life. *Journal of Personality and Social Psychology, 78*(6), 1135-1149. doi:10.1037/0022-3514.78.6.1135.
- Garrison, S. M., & Rodgers, J. L. (2017). Decomposing the causes of the socioeconomic status-health gradient with biometrical modeling. *Multivariate Behavioral Research, 52*(1), 118-119. doi:10.1080/00273171.2016.1265434.
- Gates, G. (2010). Sexual minorities in the 2008 General Social Survey: Coming out and demographic character. The Williams Institute, University of California Los Angeles. Available at <https://williamsinstitute.law.ucla.edu/wp-content/uploads/Gates-Sexual-Minorities-2008-GSS-Oct-2010.pdf>.
- Gates, G. (2016). Life evaluations of LGBT Americans decline after election. *Gallup*. Retrieved from <http://www.gallup.com/poll/199439/lgbt-status-party-wed-mid.aspx>.
- Gates, G. & Newport, F. (2012). Special Report: 3.4% of U.S. adults identify as LGBT. *Gallup*. Retrieved from <http://www.gallup.com/poll/158066/special-report-adults-identify-lgbt.aspx>.
- Gibson P. (1989). Gay male and lesbian youth suicide. Report of the Secretary's Task Force on Youth Suicide (vol. 3). Washington, DC: US Department of Health and Human Services, Government Printing Office.
- Gonzales, G., Przedworski, J., & Henning-Smith, C. (2016). Comparison of health and health risk factors between lesbian, gay, and bisexual adults and heterosexual adults in the United States: Results from the National Health Interview Survey. *JAMA Internal Medicine, 176*(9), 1344-1351. doi:10.1001/jamainternmed.2016.3432.
- Hatzenbuehler, M. L., Bellatorre, A., Lee, Y., Finch, B. K., Muennig, P., & Fiscella, K. (2014). Structural stigma and all-cause mortality in sexual minority populations. *Social Science & Medicine, 103*, 33-41. doi:10.1016/j.socscimed.2013.06.005.

- Hatzenbuehler, M. L., Nolen-Hoeksema, S., & Dovidio, J. (2009). How does stigma 'get under the skin'? The mediating role of emotion regulation. *Psychological Science*, 20(10), 1282-1289. doi:10.1111/j.1467-9280.2009.02441.x.
- Hawton, K., Saunders, K. E., & O'Connor, R. C. (2012). Self-harm and suicide in adolescents. *The Lancet*, 379(9834), 2373-2382. doi:10.1016/S0140-6736(12)60322-5.
- Hsieh, N., & Ruther, M. (2016). Sexual minority health and health risk factors: Intersection effects of gender, race, and sexual identity. *American Journal of Preventive Medicine*, 50(6), 746-755. doi:10.1016/j.amepre.2015.11.016.
- Herek, G. M. (2016). The social psychology of sexual prejudice. *Handbook of prejudice, stereotyping, and discrimination* (2nd ed.). New Rochelle, NY: Mary Ann Liebert, Inc.
- Herek, G. M., & Garnets, L. D. (2007). Sexual orientation and mental health. *Annual Review of Clinical Psychology*, 3(1), 353-375. doi:10.1146/annurev.clinpsy.3.022806.091510.
- Huang, J., Jacoby, S., Strickland, M., & Lai, K. K. (2016). Election 2016: Exit polls. *New York Times*. Retrieved from <https://www.nytimes.com/interactive/2016/11/08/us/politics/election-exit-polls.html>.
- Iida, M., Shrout, P., Laurenceau, J. P., & Bolger, N. (2012). Using diary methods in psychological research. In *APA handbook of research methods in psychology: Foundations, planning, measures and psychometrics*. American Psychological Association.
- Jena, A. B., Gray, J., Richardson, S., & Khullar D. (2017). Did the election stress Americans out?: If it did, we didn't see our doctors about it. Retrieved from FiveThirtyEight: <https://fivethirtyeight.com/features/did-the-election-stress-americans-out-if-it-did-we-didnt-see-our-doctors-about-it/>.
- Kite, M. E., & Bryant-Lees, K. B. (2016). Historical and contemporary attitudes toward homosexuality. *Teaching of Psychology*, 43(2), 164-170. doi:10.1177/0098628316636297.
- Lambda Legal (2010) When health care isn't caring: Lambda Legal's survey of discrimination against LGBT people and people with HIV. *Lambda Legal*. Available at www.lambdalegal.org/health-care-report.
- Lawrence v. Texas, 539 U.S. 558 (2003). Retrieved <https://supreme.justia.com/cases/federal/us/539/558/case.html>.
- Lewis, R. J., Derlega, V. J., Griffin, J. L., & Krowinski, A. C. (2003). Stressors for gay men and lesbians: Life stress, gay-related stress, stigma consciousness, and depressive symptoms. *Journal of Social and Clinical Psychology*, 22(6), 716-729. doi:10.1521/jscp.22.6.716.22932.

- Log Cabin Republicans. (2016). Log Cabin Republicans PAC statement on presidential endorsement decision. Retrieved from <http://www.logcabin.org/pressrelease/log-cabin-republicans-pac-statement-on-presidential-endorsement-decision/>.
- Martin-Storey, A., & August, E. G. (2016). Harassment due to gender nonconformity mediates the association between sexual minority identity and depressive symptoms. *Journal of Sex Research*, 53(1), 85-97. doi:10.1080/00224499.2014.980497.
- Mathieu, J. E., Aguinis, H., Culpepper, S. A., & Chen, G. (2012). Understanding and estimating the power to detect cross-level interaction effects in multilevel modeling. *Journal of Applied Psychology*, 97(5), 951-966. doi:10.1037/a0028380.
- Mayer, K. H., Bradford, J. B., Makadon, H. J., Stall, R., Goldhammer, H., & Landers, S. (2008). Sexual and gender minority health: What we know and what needs to be done. *American Journal of Public Health*, 98(6), 989-995. doi:10.2105/AJPH.2007.127811.
- Mays, V. M., & Cochran, S. D. (2001). Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *American Journal of Public Health*, 91(11), 1869-1876. doi:10.2105/AJPH.91.11.1869.
- McKay, T., Misra, S., & Lindquist, C. (2017). Violence and LGBTQ+ communities: What do we know, and what do we need to know? Center for Justice, Safety and Resilience, RTI International. Available at http://www.rti.org/sites/default/files/rti_violence_and_lgbtq_communities.pdf.
- McEwen, B. S., & Stellar, E. (1993). Stress and the individual: Mechanisms leading to disease. *Archives of Internal Medicine*, 153(18), 2093-2101. doi:10.1001/archinte.1993.00410180039004.
- McGarrity, L. A., & Huebner, D. M. (2014). Is being out about sexual orientation uniformly healthy?: The moderating role of socioeconomic status in a prospective study of gay and bisexual men. *Annals of Behavioral Medicine*, 47(1), 28-38. doi:10.1007/s12160-013-9575-6.
- McNair, D. M., Lorr, M., & Droppleman, L. F. (1981). Profile of mood states. San Diego, CA: Educational and Industrial Testing Service.
- Meyer, I. H. (1995). Minority stress and mental health in gay men. *Journal of Health and Social Behavior*, 36(1), 38-56. doi:10.2307/2137286.
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, 129(5), 674-697. doi:10.1037/0033-2909.129.5.674.
- Mirowsky, J., & Ross, C. E. (1991). Eliminating defense and agreement bias from measures of the sense of control: A 2 x 2 index. *Social Psychology Quarterly*, 54(2), 127-145. doi:10.2307/2786931.

- Mohr, J. J., & Sarno, E. L. (2016). The ups and downs of being lesbian, gay, and bisexual: A daily experience perspective on minority stress and support processes. *Journal of Counseling Psychology, 63*(1), 106-118. doi:10.1037/cou0000125.
- Obergefell v. Hodges 576 U.S. (2015). Retrieved from <https://supreme.justia.com/cases/federal/us/576/14-556/opinion3.html>.
- Park, H. & Mykhalyshyn, I. (2016). L.G.B.T. people are more likely to be targets of hate crimes than any other minority group. *New York Times*. Retrieved from <https://www.nytimes.com/interactive/2016/06/16/us/hate-crimes-against-lgbt.html>.
- Pearlin, L. I., & Bierman, A. (2013). Current issues and future directions in research into the stress process. In C. S. Aneshensel, J. C. Phelan, & A. Bierman (Eds.), *Handbook of the sociology of mental health* (2 ed., pp. 325-340). New York, NY: Springer Science & Business Media.
- Posner, S. (2017). Leaked draft of Trump's Religious Freedom Order reveals sweeping plans to legalize discrimination. *The Nation*. Retrieved from <https://www.thenation.com/article/leaked-draft-of-trumps-religious-freedom-order-reveals-sweeping-plans-to-legalize-discrimination/>.
- Rieger, G., Linsenmeier, J. A., Gygax, L., & Bailey, J. M. (2008). Sexual orientation and childhood gender nonconformity: Evidence from home videos. *Developmental Psychology, 44*(1), 46-58. doi:10.1037/0012-1649.44.1.46.
- Russell ST, Joyner K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health, 91*(8):1276-1281. doi:10.2105/AJPH.91.8.1276.
- Ryan, C., & Futterman, D. (1998). *Lesbian and gay youth: Care and counseling*. New York, NY: Columbia University Press.
- Sabin, J. A., Riskind, R. G., & Nosek, B. A. (2015). Health care providers' implicit and explicit attitudes toward lesbian women and gay men. *American Journal of Public Health, 105*(9), 1831-1841. doi:10.2105/AJPH.2015.302631.
- Sánchez, F. J., & Vilain, E. (2012). "Straight-acting gays": The relationship between masculine consciousness, anti-effeminacy, and negative gay identity. *Archives of Sexual Behavior, 41*(1), 111-119. doi:10.1007/s10508-012-9912-z.
- Sandfort, T., Bakker, F., Schellevis, F., & Vanwesenbeeck, I. (2006). Sexual orientation and mental and physical health status: Findings from a Dutch population survey. *American Journal of Public Health, 96*(6), 1119-1125. doi:10.2105/AJPH.2004.058891.
- Shacham, S. (1983). A shortened version of the Profile of Mood States. *Journal of Personality Assessment, 47*(3), 305-306. doi:10.1207/s15327752jpa4703_14.

- Shih, T. H., & Fan, X. (2009). Comparing response rates in e-mail and paper surveys: A meta-analysis. *Educational Research Review*, 4(1), 26-40. doi:10.1016/j.edurev.2008.01.003.
- Southern Poverty Law Center (2016). Update: 1,094 bias-related incidents in the month following the election. Retrieved from <https://www.splcenter.org/hatewatch/2016/12/16/update-1094-bias-related-incidents-month-following-election>.
- Spector, P. E., & Jex, S. M. (1998). Development of four self-report measures of job stressors and strain: Interpersonal Conflict at Work Scale, Organizational Constraints Scale, Quantitative Workload Inventory, and Physical Symptoms Inventory. *Journal of Occupational Health Psychology*, 3(4), 356-367. doi:10.1037//1076-8998.3.4.356.
- Steger, M. F., Kashdan, T., & Oishi, S. (2008). Being good by doing good: Daily eudaimonic activity and well-being. *Journal of Research in Personality*, 42(1), 22-42. doi:10.1016/j.jrp.2007.03.004.
- Swim, J. K., Johnston, K., & Pearson, N. B. (2009). Daily experiences with heterosexism: Relations between heterosexist hassles and psychological well-being. *Journal of Social and Clinical Psychology*, 28(5), 597-629. doi:10.1521/jscp.2009.28.5.597.
- Tennessee SB1556/HB1840 of 2016, Tenn. Code Ann. §63.22.3 (2017).
- Trump, D. J. [realDonaldTrump]. (2017a, July 26). "After consultation with my Generals and military experts, please be advised that the United States Government will not accept or allow....."[Twitter Post]. Retrieved from <https://twitter.com/realDonaldTrump/status/890193981585444864>
- Trump, D. J. [realDonaldTrump]. (2017b, July 26). "....Transgender individuals to serve in any capacity in the U.S. Military. Our military must be focused on decisive and overwhelming....."[Twitter Post]. Retrieved from <https://twitter.com/realDonaldTrump/status/890196164313833472>
- Trump, D. J. [realDonaldTrump]. (2017c, July 26). "....victory and cannot be burdened with the tremendous medical costs and disruption that transgender in the military would entail. Thank you"[Twitter Post]. Retrieved from <https://twitter.com/realDonaldTrump/status/890197095151546369>
- Waite, S., & Denier, N. (2015). Gay pay for straight work mechanisms generating disadvantage. *Gender & Society*, 29(4), 561-588. doi:10.1177/0891243215584761.
- Wang, S. (2016). Final projections: Clinton 323 EV, 51 Democratic Senate seats, GOP House. *Princeton Election Consortium*. Retrieved from <http://election.princeton.edu/2016/11/08/final-mode-projections-clinton-323-ev-51-di-senate-seats-gop-house/>.
- Ware, J. E., Jr., & Sherbourne, C. D. (1992). The MOS 36-Item Short-Form Health Survey (SF-36): I. Conceptual framework and item selection. *Medical Care*, 30(6), 473-483. doi:10.1097/00005650-199206000-00002.

- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063-1070. doi:10.1037//0022-3514.54.6.1063.
- Williams, D. R., Gonzalez, H. M., Williams, S., Mohammed, S. A., Moomal, H., & Stein, D. J. (2008). Perceived discrimination, race and health in South Africa. *Social Science & Medicine*, 67(3), 441-452. doi:10.1016/j.socscimed.2008.03.02.
- Zinbarg, R., Yovel, I., Revelle, W., & McDonald, R. (2006). Estimating generalizability to a universe of indicators that all have one attribute in common: A comparison of estimators for omega. *Applied Psychological Measurement*, 30(2), 121-144. doi:10.1177/0146621605278814.

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Tables and Sections are organized primarily by order of appearance in the main text.

Table S1 Items used in gender-nonconformity index

Item	Question
1	'How feminine or masculine are you?'
2	'How feminine or masculine do you think other people would rate you?'
3	'How masculine would you rate your typical speech?'
4	'How masculine would you rate your typical body movement?'
5	How masculine would you rate your typical mannerisms?
6	'How masculine would you rate your typical body build?'
7	'How masculine would you rate your typical facial features?'

Section S2 Paired T-Tests

Table S2.1 Paired T-tests Comparing Day Before the Election to Day After

	Mean	Mean	Mean	Mean	Pooled					
	Nov 7th	Nov 8th	Nov 9th	Difference	SD	t	p	Cohen's D	95% CI	n
				within						
				person						
Anxiety	2.14	2.36	3.18	1.05	1.08	7.60	<.001	0.97	[0.71, 1.22]	79
Depression	1.63	1.72	2.97	1.30	0.98	9.50	<.001	1.33	[1.05, 1.61]	79
Discrimination	1.41	1.27	1.43	0.05	0.64	0.54	.600	0.07	[-0.20, 0.34]	79
Happiness	6.83	6.54	4.82	-1.87	2.09	6.60	<.001	-0.89	[-1.17, -0.62]	79
Identity Concealment	1.37	1.39	1.36	-0.05	0.68	0.85	.400	-0.07	[-0.24, 0.10]	79
Loneliness	1.87	1.87	2.23	0.38	1.06	2.90	.005	0.36	[0.11, 0.61]	79
Negative Affect	1.70	1.87	2.91	1.18	0.83	12.0	<.001	1.42	[1.18, 1.67]	79
Physical Health	2.97	3.11	2.70	-0.33	1.07	2.30	.020	-0.31	[-0.57, -0.04]	76
Physical Illness	1.54	1.44	1.60	0.11	0.48	2.30	.020	0.22	[0.03, 0.42]	78
Positive Affect	3.16	3.04	2.79	-0.30	0.93	2.90	.005	-0.32	[-0.55, -0.10]	79
Self-Esteem	3.47	3.55	3.50	0.06	1.14	0.64	.500	0.06	[-0.12, 0.23]	77
Sense of Control	1.95	3.88	2.87	0.90	1.08	6.50	<.001	0.83	[-1.08, -0.57]	77
Sense of Purpose	4.98	4.97	4.60	-0.26	1.67	1.80	.080	-0.16	[-0.33, 0.02]	79
Sleep Quality	3.80	3.89	3.18	-0.68	1.19	4.60	<.001	-0.57	[-0.82, -0.33]	79
Stress	2.36	2.42	2.93	0.54	0.85	5.90	<.001	0.63	[0.42, 0.85]	79

Table S2.2 Paired T-tests Comparing Election Day to Day After

	Mean							
	Difference	Pooled						
	within	SD	t	p	Cohen's D	95% CI	n	
	person							
Anxiety	0.75	1.15	6.18	<.001	0.65	[0.44, 0.86]	83	
Depression	1.25	1.03	8.54	<.001	1.21	[0.93, 1.49]	83	
Discrimination	0.15	0.57	2.53	.013	0.27	[0.06, 0.48]	87	
Happiness	-1.69	2.18	6.82	<.001	-0.77	[-1.00, -0.55]	85	
Identity Concealment	0.04	0.64	0.84	.404	0.06	[-0.08, 0.20]	86	
Loneliness	0.41	1.10	3.56	<.001	0.38	[0.17, 0.58]	85	
Negative Affect	1.08	0.91	9.90	<.001	1.19	[0.95, 1.43]	84	
Physical Health	-0.38	1.06	3.03	.003	-0.35	[-0.59, -0.12]	80	
Physical Illness	0.18	0.44	3.66	<.001	0.40	[0.18, 0.62]	82	
Positive Affect	-0.24	0.95	2.88	.005	-0.26	[-0.44, -0.08]	84	
Self-Esteem	0.02	1.16	0.25	.801	0.02	[-0.14, 0.18]	84	
Sense of Control	-0.90	1.17	6.15	<.001	-0.76	[-1.01, -0.52]	84	
Sense of Purpose	-0.39	1.62	3.11	.003	-0.24	[-0.39, -0.09]	85	
Sleep Quality	-0.72	1.17	4.64	<.001	-0.62	[-0.88, -0.35]	83	
Stress	0.58	0.83	7.03	<.001	0.70	[0.50, 0.90]	83	

Section S3 Main Model

S3.1 Linear mixed effects Model Specification (Tables 2 and 3)

$$\begin{aligned}Y_{ij} &= \beta_{0j} + \beta_{1j} X_{ij} + e_{ij} \\ \beta_{0j} &= \gamma_{00} + u_{0j} \\ \beta_{1j} &= \gamma_{10} + u_{1j}\end{aligned}$$

Y_{ij} indicates the score on the dependent variable for an individual observation i for subject j .

X_{ij} indicates the dummy variable day-after-the-election. Is coded as 1 if time of observation i is 3, 0 otherwise.

β_{0j} indicates the intercept of the dependent variable for subject j .

β_{1j} indicates the slope for the relationship of subject j between the dummy variable day-after-election and the dependent variable.

e_{ij} indicates level 1 error component.

γ_{00} indicates the grand mean of the scores on the dependent variable.

u_{0j} indicates error component of the intercept.

γ_{10} indicates the overall regression coefficient between the dependent variable and the day-after-the-election predictor.

u_{1j} indicates the error component for the slope.

S3.1.1 Sample R Syntax using LMER

```
lmer(anxiety_c ~ 1 + factor(dayafter_e) + (1 + factor(dayafter_e) | id), data=data_q)
```

Section S4 Moderator Analyses

S4.1 Model specification for moderator analyses

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{1ij} + \beta_{2j} X_{2j} + \beta_{3j} (X_{1ij} * X_{2j}) + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

Y_{ij} indicates the score on the dependent variable for an individual observation i for subject j .

X_{1ij} indicates the dummy variable day-after-the-election. Is coded as 1 if time of observation i is 3, 0 otherwise.

X_{2j} indicates the dummy variable visibility-status. Is coded as 1 if subject was recruited because of High Visibility, 0 otherwise.

β_{0j} indicates the intercept of the dependent variable for subject j .

β_{1j} indicates the slope for the relationship for subject j between the dummy variable day-after-election and the dependent variable.

β_{2j} indicates the slope for the relationship for subject j between the dummy variable visibility-status and the dependent variable.

β_{3j} indicates the slope for the relationship for subject j between the dependent variable and the interaction between dummy variable visibility-status and dummy variable day-after-election.

e_{ij} indicates level 1 error component.

γ_{00} indicates the grand mean of the scores on the dependent variable.

u_{0j} indicates error component of the intercept.

γ_{10} indicates the overall regression coefficient between the dependent variable and the day-after-the-election predictor.

u_{1j} indicates the error component for the slope.

γ_{20} indicates the overall regression coefficient between the dependent variable and the visibility-status predictor.

γ_{30} indicates the overall regression coefficient between the dependent variable and the interaction of visibility-status predictor with day-after-the-election predictor.

S4.1.1 Sample R Syntax using LMER

```
lmer(anxiety_c ~ 1 + factor(dayafter_e) + factor(highvis)+factor(dayafter_e):factor(highvis) + (1 + factor(dayafter_e) | id),data=data_q)
```

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Table S4.2 Moderator Analyses: Group-Mean Centered
Fixed Effects

	Intercept	SE	t	p	Day after Election	SE	t	p	Visibility	SE	t	p	Interaction	SE	t	p	ICC
Anxiety	-0.27	0.05	5.51	<.001	1.04	0.09	11.05	<.001	-0.04	0.07	0.61	0.543	ns	ns	ns	ns	0.28
Depression	-0.45	0.05	8.62	<.001	1.22	0.09	13.12	<.001	-0.06	0.07	0.79	0.433	ns	ns	ns	ns	0.40
Discrimination	-0.56	0.07	8.04	<.001	0.19	0.05	3.88	<.001	-0.10	0.10	0.99	0.322	ns	ns	ns	ns	0.82
Happiness	2.92	0.18	15.81	<.001	-1.43	0.24	5.93	<.001	-0.95	0.26	3.63	<.001	-0.68	0.35	1.94	0.055	0.76
Identity Concealment	-0.50	0.08	6.53	<.001	0.08	0.03	2.44	0.016	-0.19	0.11	1.77	0.078	ns	ns	ns	ns	0.88
Loneliness	-0.35	0.06	5.80	<.001	0.48	0.08	5.89	<.001	-0.08	0.09	1.00	0.320	ns	ns	ns	ns	0.55
Negative Affect	-0.41	0.05	7.74	<.001	1.14	0.07	15.39	<.001	-0.09	0.07	1.19	0.234	ns	ns	ns	ns	0.44
Physical Health	0.68	0.10	6.64	<.001	-0.37	0.09	4.23	<.001	-0.56	0.14	3.85	<.001	ns	ns	ns	ns	0.73
Physical Illness	-0.46	0.06	7.21	<.001	0.19	0.04	5.37	<.001	-0.12	0.09	1.40	0.162	ns	ns	ns	ns	0.90
Positive Affect	0.45	0.09	5.32	<.001	-0.03	0.07	0.44	0.66	-0.46	0.12	3.80	<.001	ns	ns	ns	ns	0.66
Self-Esteem	0.99	0.11	9.39	<.001	-0.07	0.06	1.12	0.27	-0.68	0.15	4.60	<.001	ns	ns	ns	ns	0.84
Sense of Control	1.15	0.11	10.77	<.001	-0.89	0.10	8.85	<.001	-0.53	0.15	3.53	0.001	ns	ns	ns	ns	0.78
Sense of Purpose	1.79	0.13	13.63	<.001	-0.35	0.10	3.44	0.001	-0.78	0.19	4.21	<.001	ns	ns	ns	ns	0.82
Sleep Quality	1.06	0.11	9.48	<.001	-0.67	0.11	6.26	<.001	-0.50	0.16	3.16	0.002	ns	ns	ns	ns	0.71
Stress	-0.07	0.05	1.54	0.125	0.67	0.08	8.66	<.001	0.05	0.07	0.73	0.47	-0.19	0.11	1.73	0.087	0.51

Notes: Interaction retained if nested-model comparisons were significant at $p < .10$; ICC = Intraclass Correlation Coefficient; ns = not significant

Table S4.3 Moderator Analyses: Group-Mean Centered
Random Effects

	Intercept	Slope	Residual	obs(subjects)
Anxiety	0.17	0.54	0.44	1092(247)
Depression	0.23	0.64	0.34	1092(247)
Discrimination	0.59	0.12	0.13	1137(268)
Happiness	3.75	2.16	1.21	1107(254)
Identity Concealment	0.72	0.01	0.09	1123(262)
Loneliness	0.36	0.45	0.30	1107(254)
Negative Affect	0.24	0.27	0.31	1098(250)
Physical Health	1.12	0.33	0.43	1059(244)
Physical Illness	0.48	0.08	0.05	1077(241)
Positive Affect	0.76	0.02	0.39	1098(250)
Self-Esteem	1.28	0.15	0.24	1093(252)
Sense of Control	1.27	0.68	0.36	1095(252)
Sense of Purpose	1.97	0.64	0.42	1107(254)
Sleep Quality	1.32	0.63	0.54	1082(244)
Stress	0.20	0.12	0.19	1096(250)

Notes: Random effects not explicitly tested for significance, Obs = Observation.

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S5 Time-Varying Effects

S5.1 Method

We included additional exploratory tests of change over the ten-day period, beyond day-after effects. We tested linear, quadratic, cubic, and quartic trajectories, using nested-model comparisons and an approach adapted from Iida, Shrout, Laurenceau, and Bolger (2012). Specifically, we created time variables, indicating which survey day it was (day 1 – day 10). The values were coded in such a manner that the coefficient would be interpretable as the total estimated change over the 10-day period. For linear effects, this rescaled time variable $\left(\frac{t}{10}\right)$ indicates time, measured in days, of observation i , such that day 1 is coded as $1/10$, day 2 is coded as $2/10$, ..., day 10 is coded as $10/10$. Additional, higher-order effects were also coded to obtain the same total estimated change over the period. Model specifications for the highest-order model $\left(\text{quartic} \left(\frac{t}{10}\right)^4\right)$ are provided in the next section. Lower-order models $\left(\text{cubic} \left(\frac{t}{10}\right)^3, \text{quadratic} \left(\frac{t}{10}\right)^2, \text{linear} \left(\frac{t}{10}\right)^1\right)$ are nested within the quartic model and can be derived by excluding all higher-ordered terms. The more complex model (i.e. higher-order model) was retained if the nested model comparison was significant at the .10 level. All linear models were compared to their respective linear mixed effect model from Table 2. All variables were group-mean centered. Grand-mean centered versions of these analyses led to practically the same conclusions, albeit with different coefficients.)

S5.2 Model Specification for time-varying models

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{1ij} + \beta_{2j} \frac{t}{10} + \beta_{3j} \left(\frac{t}{10}\right)^2 + \beta_{4j} \left(\frac{t}{10}\right)^3 + \beta_{5j} \left(\frac{t}{10}\right)^4 + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

Y_{ij} indicates the score on the dependent variable for an individual observation i for subject j .

X_{1ij} indicates the dummy variable day-after-the-election. Is coded as 1 if time of observation i is 3, 0 otherwise.

$\frac{t}{10}$ is a rescaled time variable that indicates time of observation i , such that day 1 is coded as 1/10, day 2 is coded as 2/10, ..., day 10 is coded as 10/10.

$\left(\frac{t}{10}\right)^2$ is a rescaled time variable that indicates time of observation i , such that day 1 is coded as 1/100, day 2 is coded as 4/100 ..., day 10 is coded as 100/100.

$\left(\frac{t}{10}\right)^3$ is a rescaled time variable that indicates time of observation i , such that day 1 is coded as 1/1000, day 2 is coded as 8/1000 ..., day 10 is coded as 1000/1000.

$\left(\frac{t}{10}\right)^4$ is a rescaled time variable that indicates time of observation i , such that day 1 is coded as 1/10000, day 2 is coded as 16/10000, ..., day 10 is coded as 10000/10000.

β_{0j} indicates the intercept of the dependent variable for subject j .

β_{1j} indicates the slope for the relationship for subject j between the dummy variable day-after-election and the dependent variable.

β_{2j} indicates the slope for linear change between rescaled time $\left(\frac{t}{10}\right)$ and the dependent variable for subject j .

β_{3j} indicates the slope for quadratic change between rescaled time $\left(\frac{t}{10}\right)^2$ and the dependent variable for subject j .

β_{4j} indicates the slope for cubic change between rescaled time $\left(\frac{t}{10}\right)^3$ and the dependent variable for subject j .

β_{4j} indicates the slope for quartic change between rescaled time $\left(\frac{t}{10}\right)^4$ and the dependent variable for subject j .

e_{ij} indicates level 1 error component.

γ_{00} indicates the grand mean of the scores on the dependent variable.

u_{0j} indicates error component of the intercept.

γ_{10} indicates the overall regression coefficient between the dependent variable and the day-after-the-election predictor

u_{1j} indicates the error component for the slope.

γ_{20} indicates the overall regression coefficient between the dependent variable and rescaled time $\left(\frac{t}{10}\right)$.

u_{2j} indicates the error component for the slope.

γ_{30} indicates the overall regression coefficient between the dependent variable and rescaled time $\left(\frac{t}{10}\right)^2$.

γ_{40} indicates the overall regression coefficient between the dependent variable and rescaled time $\left(\frac{t}{10}\right)^3$.

γ_{50} indicates the overall regression coefficient between the dependent variable and rescaled time $\left(\frac{t}{10}\right)^4$.

S5.2.1 Sample R Syntax using LMER

```
lmer(anxiety_c ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 + day_rescale_3 +  
day_rescale_4 + (1+factor(dayafter_e)+day_rescale|id), data=data_q)
```

S5.3 Expanded Results

S5.3.1 General Findings. All models were significantly improved by adding linear-change terms, indicating at least linear trajectories (see Table S5.4). In three cases (i.e., physical health, sense of purpose, and sleep quality), fixed effects for the linear-change term were not significant, but the random effects were. Thus, while there was no overall between-person linear trajectory, there was still meaningful variability at the individual level. For many variables, the best-fitting models were higher ordered: quadratic (discrimination, identity concealment, loneliness, physical illness, positive affect, self-esteem), cubic (depression, negative affect,), or quartic (stress). Still, a significant day-after-the-election effect remained across measures, except for self-esteem and identity concealment. Although null result for self-esteem was expected, non-significant results for identity concealment suggest that the change in concealing behavior was not specific to the day after the election, and rather indicated a heightened concealment during the early days (1-3), with a gradual decline afterwards. (See Table S5.6 for net effects by day.)

In the next subsections, we illustrate how to interpret the basic time-varying model as well as a more complex higher-order time varying model. Although interpreting the coefficients independently for each class of model is informative, examining the daily net effect of these coefficients may be more intuitive. Accordingly, we provided estimated net effects for each day, using the best fitting model (Table S5.6).

S5.3.2 Linear-Change Model Interpretation.

To recap, the following variables were best explained with the addition of a linear-change effect: anxiety, happiness, physical health, sense of control, sense of purpose, and sleep quality. We illustrate how to interpret these linear models and their coefficients with the anxiety variable.

Nested model comparisons found that it was a significant improvement over the mixed effects model from Table 2 ($p < .001$), whereas the addition of a quadratic-change term was not a significant improvement ($p = .102$). The day-after the election effect indicated a 0.94^1 raw-score increase in anxiety for each person on the day after the election ($p < .001$), relative to all other days and independent of linear-change effects. The linear-change effect indicated a 0.58 raw score decline in anxiety over the 10-day study period or 0.058 raw-score units per day ($p < .001$). Combined, these effects illustrate a marked spike in anxiety, occurring on the day after the election, with a gradual decline in anxiety levels. This spike increased the average anxiety level; thus, unsurprisingly, anxiety levels declined to below each person's average (i.e., negative values). Figure S5.3.2.1 displays group-mean centered anxiety, where estimated net effects from Table S5.6 are superimposed as black dots over a Figure-1 style plot. The only difference between the Figure 1 plot of anxiety and the one here is that anxiety is group-mean centered, instead of raw-score anxiety.

¹ For comparison, the group-mean centered day-after effect for anxiety was 1.04 in the main analysis (See Table 2).

Figure S5.3.2.1 Changes in Group-Mean Centered Anxiety among Gay Men and Lesbians during the 2016 USA Presidential Election

S5.3.3 Higher Order Model Interpretation.

In contrast with the relatively straightforward interpretation of linear change models, the higher-order models are less straight forward. We strongly encourage readers to focus on the net effects. We illustrate how to interpret a cubic-level models and their coefficients with the negative affect variable.

Nested model comparisons found that it was a significant improvement over the mixed effects model from Table 2 ($p < .001$), whereas the addition of a quartic-change term was not a significant improvement ($p = .103$). The day-after the election effect indicated a 0.86^2 raw-score increase in negative affect for each person on the day after the election ($p < .001$), relative to all other days and independent of linear-, quadratic-, and cubic-change effects. The linear-change effect

² For comparison, the group-mean centered day-after effect for anxiety was 1.14 in the main analysis (See Table 2).

indicated a 5.23 raw score increase in negative affect over the 10-day study period or 0.523 raw-score units per day. The quadratic-change effect indicated a 11.61 raw-score decrease in negative affect over the 10-day study period ($p < .001$). The cubic-change effect indicated a 6.63 raw-score increase in negative affect over the 10-day study period ($p < .001$).

Combined, these effects illustrate a marked spike in negative affect, occurring on the day after the election, with an overall cubic trend in negative-affect levels. This spike increased the average negative affect level; thus, unsurprisingly, negative affect levels declined to below each person's average (i.e., negative values) by study's end. Figure S5.3.3.1 displays group-mean centered negative affect, where estimated net effects from Table S5.6 are superimposed as black dots over a Figure-1 style plot. The only difference between the Figure 1 plot of negative affect and the one here is that negative affect is group-mean centered, instead of raw-score negative affect.

Figure S5.3.3.1 Changes in Group-Mean Centered Negative Affect among Gay Men and Lesbians during the 2016 USA Election

Supplemental Online Material

Table S5.4: Time-Variant Analyses: Group-Mean Centered
Fixed Effects

	Intercept	SE	t	p	Day after Election	SE	t	p	Linear $\left(\frac{t}{10}\right)$	SE	t	p	ICC
Anxiety	-0.002	0.05	0.05	0.959	0.94	0.09	10.43	<.001	-0.58	0.08	6.85	<.001	0.24
Depression	-0.90	0.10	8.68	<.001	0.97	0.10	9.94	<.001	4.62	0.85	5.46	<.001	0.35
Discrimination	-0.39	0.06	6.86	<.001	0.13	0.05	2.61	0.01	-0.68	0.17	4.13	<.001	0.83
Happiness	2.22	0.13	17.30	<.001	-1.70	0.18	9.50	<.001	0.35	0.15	2.43	0.016	0.71
Identity Concealment	-0.42	0.06	6.76	<.001	0.03	0.03	1.00	0.318	-0.57	0.14	3.95	<.001	0.90
Loneliness	-0.17	0.06	2.61	0.009	0.43	0.08	5.19	<.001	-0.77	0.26	2.98	0.003	0.44
Negative Affect	-0.87	0.10	8.90	<.001	0.86	0.08	11.19	<.001	5.23	0.78	6.74	<.001	0.45
Physical Health	0.34	0.07	4.71	<.001	-0.34	0.18	3.80	<.001	0.10	0.11	0.92	0.359	0.71
Physical Illness	-0.39	0.05	7.86	<.001	0.17	0.04	4.75	<.001	-0.52	0.11	4.65	<.001	0.90
Positive Affect	0.57	0.08	6.99	<.001	-0.13	0.06	1.98	0.049	-1.17	0.29	4.07	<.001	0.67
Self-Esteem	0.37	0.09	4.17	<.001	-0.05	0.06	0.72	0.472	1.19	0.24	4.97	<.001	0.85
Sense of Control	0.80	0.07	10.77	<.001	-0.85	0.09	8.41	<.001	0.15	0.08	1.90	0.060	0.73
Sense of Purpose	1.34	0.10	13.73	<.001	-0.33	0.10	3.13	0.002	0.09	0.10	0.92	0.362	0.83
Sleep Quality	0.75	0.08	9.25	<.001	-0.64	0.11	5.89	<.001	0.10	0.11	0.96	0.337	0.67
Stress	-0.43	0.14	2.98	0.003	0.44	0.06	6.82	<.001	4.73	1.69	2.79	0.005	0.41
	Quadratic $\left(\frac{t}{10}\right)^2$	SE	t	p	Cubic $\left(\frac{t}{10}\right)^3$	SE	t	p	Quartic $\left(\frac{t}{10}\right)^4$	SE	t	p	obs
Anxiety	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1091
Depression	-9.55	1.80	5.31	<.001	5.20	1.09	4.77	<.001	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1091
Discrimination	0.29	0.14	2.05	0.041	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1129
Happiness	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1104
Identity Concealment	0.27	0.13	2.19	0.029	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1117
Loneliness	0.44	0.23	1.90	0.058	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1103
Negative Affect	-11.61	1.65	7.04	<.001	6.63	1.00	6.64	<.001	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1096
Physical Health	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1059
Physical Illness	0.35	0.10	3.49	0.001	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1077
Positive Affect	0.63	0.26	2.46	0.014	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1096
Self-Esteem	-0.88	0.21	4.14	<.001	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1089
Sense of Control	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1091
Sense of Purpose	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1104
Sleep Quality	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	1082
Stress	-14.34	5.89	-2.44	0.015	16.17	7.84	2.06	0.040	-6.27	3.53	-1.78	0.076	1094

Notes: Time-varying effect retained if nested-model comparisons were significant at $p < .10$; Obs = Observation; ICC = Intraclass Correlation Coefficient; *ns* = not significant.

Table S5.5: Time-Variant Analyses: Group-Mean Centered
Random Effects

	Intercept	Day after Election Slope	Linear Effect Slope	Residual	Highest Order
Anxiety	0.12	0.46	0.32	0.38	1
Depression	0.17	0.66	0.13	0.31	3
Discrimination	0.48	0.14	0.36	0.10	2
Happiness	2.79	2.12	0.69	1.15	1
Identity Concealment	0.75	0.02	0.21	0.07	2
Loneliness	0.22	0.47	0.28	0.28	2
Negative Affect	0.21	0.28	0.27	0.26	3
Physical Health	0.82	0.43	1.02	0.34	1
Physical Illness	0.44	0.09	0.04	0.05	2
Positive Affect	0.65	0.04	0.49	0.32	2
Self-Esteem	1.23	0.16	0.11	0.22	2
Sense of Control	0.96	0.68	0.16	0.35	1
Sense of Purpose	1.89	0.71	0.54	0.38	1
Sleep Quality	0.99	0.68	0.65	0.49	1
Stress	0.13	0.14	0.16	0.18	4

Notes: Time varying effect retained if nested-model comparisons were significant at $p < .10$; Random effects not explicitly tested for significance

Table S5.6 Estimated Net Effect by Day from Best-Fitting Time-Variant Analyses: Group-Mean Centered

	Day 1	2	3	4	5	6	7	8	9	10
Anxiety	-0.06	-0.12	0.77	-0.23	-0.29	-0.35	-0.41	-0.46	-0.52	-0.58
Depression	-0.53	-0.32	0.74	-0.25	-0.33	-0.45	-0.57	-0.66	-0.69	-0.64
Discrimination	-0.45	-0.51	-0.44	-0.61	-0.65	-0.69	-0.72	-0.74	-0.76	-0.77
Happiness	2.26	2.29	0.63	2.37	2.40	2.44	2.47	2.51	2.54	2.58
Identity Concealment	-0.48	-0.53	-0.54	-0.61	-0.64	-0.67	-0.69	-0.70	-0.71	-0.72
Loneliness	-0.24	-0.30	0.08	-0.40	-0.44	-0.47	-0.49	-0.50	-0.50	-0.50
Negative Affect	-0.45	-0.23	0.70	-0.21	-0.33	-0.48	-0.62	-0.72	-0.73	-0.62
Physical Health	0.35	0.36	0.03	0.38	0.39	0.40	0.41	0.42	0.43	0.44
Physical Illness	-0.44	-0.48	-0.34	-0.54	-0.56	-0.58	-0.58	-0.58	-0.58	-0.56
Positive Affect	0.46	0.36	0.14	0.20	0.14	0.09	0.06	0.03	0.02	0.03
Self-Esteem	0.48	0.57	0.60	0.70	0.74	0.76	0.77	0.75	0.72	0.67
Sense of Control	0.81	0.83	-0.01	0.86	0.87	0.89	0.90	0.92	0.93	0.95
Sense of Purpose	1.35	1.36	1.04	1.38	1.38	1.39	1.40	1.41	1.42	1.43
Sleep Quality	0.76	0.77	0.14	0.79	0.80	0.81	0.82	0.83	0.84	0.85
Stress	-0.08	0.06	0.52	0.04	-0.02	-0.07	-0.11	-0.12	-0.12	-0.15

Note: Estimated from $\hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_2 \frac{t}{10} + \hat{\beta}_3 \left(\frac{t}{10}\right)^2 + \hat{\beta}_4 \left(\frac{t}{10}\right)^3 + \hat{\beta}_5 \left(\frac{t}{10}\right)^4$

R Code

Abstract

Last compiled 08/21/2017 at 12:21:12

```
## simulated data that resembles election data
library(Matrix)    # ... for matrix operations
library(matrixStats)
library(lmerTest)  # ... for mlm
library(stats)    # ... for statistical operations
library(MASS)      # ... for Multivariate Normal Distribution
library(ggplot2)   # ... for plots
library(reshape2)

set.seed(2016)
```

Simulated Data

```
# Simulate Data based on covariance and means of sense of control (not reverse scored)
## Covariance structure
Sigma=matrix(c(0.683,0.388,0.438,0.442,0.222,0.419,0.395,0.420,0.298,0.337,
```

```
0.388,1.012,0.481,0.599,0.242,0.519,0.409,0.482,0.251,0.308,
0.438,0.481,1.836,1.021,0.686,0.511,0.407,0.811,0.652,0.675,
0.442,0.599,1.021,1.208,0.655,0.776,0.662,0.664,0.514,0.491,
0.222,0.242,0.686,0.655,0.849,0.566,0.509,0.440,0.427,0.439,
0.419,0.519,0.511,0.776,0.566,0.738,0.615,0.445,0.344,0.388,
0.395,0.409,0.407,0.662,0.509,0.615,0.663,0.433,0.401,0.478,
0.420,0.482,0.811,0.664,0.440,0.445,0.433,0.911,0.532,0.436,
0.298,0.251,0.652,0.514,0.427,0.344,0.401,0.532,0.636,0.451,
0.337,0.308,0.675,0.491,0.439,0.388,0.478,0.436,0.451,0.720),byrow=TRUE, nrow=10)

## Means by day
mu=c(1.9,2,3,2.2,2,1.9,1.8,1.9,1.8,1.9)

## Generate multivariate norm data by cov and mu, sample size 300
data_sim=as.data.frame(mvrnorm(300,mu,Sigma))
## rename simulated data
names(data_sim)= c("senseofcontrol_t1","senseofcontrol_t2",
                    "senseofcontrol_t3","senseofcontrol_t4",
                    "senseofcontrol_t5","senseofcontrol_t6",
                    "senseofcontrol_t7","senseofcontrol_t8",
                    "senseofcontrol_t9","senseofcontrol_t10")

## create variables
### id
data_sim$id=c(1:nrow(data_sim))

#Unbiased Mean
data_sim$senseofcontrol_unbiased_mean= rowMeans2(as.matrix(data_sim),rows=1:10)
## measure of missingness
data_sim$completed=0
data_sim$completed=rowSums(data.frame(!is.na(data_sim$senseofcontrol_t1)
```



```
,!is.na(data_sim$senseofcontrol_t2)
,!is.na(data_sim$senseofcontrol_t3)
,!is.na(data_sim$senseofcontrol_t4)
,!is.na(data_sim$senseofcontrol_t5)
,!is.na(data_sim$senseofcontrol_t6)
,!is.na(data_sim$senseofcontrol_t7)
,!is.na(data_sim$senseofcontrol_t8)
,!is.na(data_sim$senseofcontrol_t9)
,!is.na(data_sim$senseofcontrol_t10)))

# restructure data
## convert to long form from wide
### create list with all days of variable
varyingNames <- list("senseofcontrol" =
  c("senseofcontrol_t1","senseofcontrol_t2",
    "senseofcontrol_t3","senseofcontrol_t4",
    "senseofcontrol_t5","senseofcontrol_t6",
    "senseofcontrol_t7","senseofcontrol_t8",
    "senseofcontrol_t9","senseofcontrol_t10"))

### reshape into long
data_sim_long <- reshape(data_sim, direction="long",
  idvar="id", timevar="day", times=c(1:10),
  v.names=names(varyingNames), varying=varyingNames, sep="_t")

## create day after election variable
data_sim_long$dayafter_e=0
data_sim_long$dayafter_e[data_sim_long$day==3]<- 1
```

```
## create missingness, remove 20% of data (more from later days)
### 10% from anywhere
data_sim_long$senseofcontrol[sample(nrow(data_sim_long),
                                     .1*nrow(data_sim_long))]=NA

### 10% from days after 5
data_sim_long$senseofcontrol[data_sim_long$day>4][sample(
  nrow(data_sim_long[data_sim_long$day>4,]),
  .1*nrow(data_sim_long[data_sim_long$day>4,]))]=NA

## standardize variable, grand mean centered
data_sim_long$senseofcontrol_z<-scale(data_sim_long$senseofcontrol,
                                       center=TRUE, scale=TRUE)

## standardize group mean centered
### create mean by id
senseofcontrol_mean=aggregate(senseofcontrol ~ id, data=data_sim_long, FUN=mean)
names(senseofcontrol_mean)=c("id", "senseofcontrol_mean")
### merge biased mean back in
data_sim_long=merge(data_sim_long, senseofcontrol_mean, by="id")

data_sim_long$senseofcontrol_c=
  data_sim_long$senseofcontrol-data_sim_long$senseofcontrol_mean

## Non-linear effects
### create day variables of various linearities
data_sim_long$day_rescale=data_sim_long$day/10
data_sim_long$day_rescale_2=(data_sim_long$day/10)^2
data_sim_long$day_rescale_3=(data_sim_long$day/10)^3
```

```

data_sim_long$day_rescale_4=(data_sim_long$day/10)^4

## Effects Matrix, to be used to derive estimated total effect by day
neteffects_calc=matrix(data=rep(0,10*5),nrow = 10)
rownames(neteffects_calc)=paste0("day_",1:10)
colnames(neteffects_calc)=c("day_after","t1","t2","t3","t4")
neteffects_calc[3,1]=1 #day after election
neteffects_calc[,2]=(1:10)/10
neteffects_calc[,3]=((1:10)/10)^2
neteffects_calc[,4]=((1:10)/10)^3
neteffects_calc[,5]=((1:10)/10)^4

```

Analysis

Group-Mean Centered

```

#Analysis
# Group Mean Centered
## main effects, with random intercepts and slope
mlm <-lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+
           (1+factor(dayafter_e)|id), data=data_sim_long)

## main effects, with random intercepts and no random slope
mlm_nrs <-lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+
              (1|id), data=data_sim_long)

## is random slope, significant improvement?
mlm_anova<-anova(mlm,mlm_nrs)

```

```
## refitting model(s) with ML (instead of REML)

## only uses ML for anova
### pvalue
mlm_anova[2,8]

## [1] 2.36e-24

## MLM final model
summary(mlm)

## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_c ~ 1 + factor(dayafter_e) + (1 + factor(dayafter_e) |
## id)
## Data: data_sim_long
##
## REML criterion at convergence: 4746
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.654 -0.607 -0.023  0.627  4.168
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   id      (Intercept)          0.00631  0.0795
##           factor(dayafter_e)1  0.52129  0.7220  -1.00
## Residual                    0.34632  0.5885
## Number of obs: 2535, groups: id, 300
```

```
##
## Fixed effects:
##
```

	Estimate	Std. Error	df	t value	Pr(> t)
## (Intercept)	-0.1095	0.0132	911.0000	-8.3	4.4e-16 ***
## factor(dayafter_e)1	1.0182	0.0576	286.0000	17.7	< 2e-16 ***

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr)
## fctr(dyf_)1 -0.453

confint(mlm, method = "Wald")

##          2.5 % 97.5 %
## .sig01      NA      NA
## .sig02      NA      NA
## .sig03      NA      NA
## .sigma      NA      NA
## (Intercept) -0.135 -0.0836
## factor(dayafter_e)1 0.905 1.1311

#tests of time variance/linearity
fit.object0=lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+
                 (1+factor(dayafter_e)|id), data=data_sim_long)

fit.object1=lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+day_rescale+
                 (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object1)
```

```
## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_c ~ 1 + factor(dayafter_e) + day_rescale + (1 +
## factor(dayafter_e) + day_rescale | id)
## Data: data_sim_long
##
## REML criterion at convergence: 4705
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.761 -0.579 -0.019  0.606  3.683
##
## Random effects:
## Groups   Name                Variance Std.Dev. Corr
## id      (Intercept)          0.104    0.323
##          factor(dayafter_e)1 0.610    0.781   -0.59
##          day_rescale          0.275    0.525   -0.97  0.37
## Residual                    0.321    0.566
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   -0.0243    0.0319 347.0000   -0.76   0.4463
## factor(dayafter_e)1  0.9784    0.0602 291.0000   16.25 <2e-16 ***
## day_rescale    -0.1504    0.0508 301.0000   -2.96   0.0033 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Correlation of Fixed Effects:
##           (Intr) fc(_)1
## fctr(dyf_)1 -0.460
## day_rescale -0.916  0.309

## Is linear effect significant improvement?
mlm_anova<-anova(fit.object1,fit.object0)

## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 0.00000000385

####Significant?
mlm_anova[2,8]<.1

## [1] TRUE

## Quadratic?
fit.object2=lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+
                day_rescale+day_rescale_2+
                (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object2)

## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
```

```
## senseofcontrol_c ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 +
##   (1 + factor(dayafter_e) + day_rescale | id)
##   Data: data_sim_long
##
## REML criterion at convergence: 4701
##
## Scaled residuals:
##   Min      1Q  Median      3Q      Max
## -3.744 -0.581 -0.019  0.608  3.708
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   id       (Intercept)          0.104    0.323
##           factor(dayafter_e)1  0.610    0.781   -0.59
##           day_rescale          0.276    0.525   -0.97  0.37
##   Residual                    0.320    0.566
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##               Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    -0.1081    0.0454 1118.0000   -2.38   0.0175
## factor(dayafter_e)1  0.9666    0.0604  294.0000   16.02  <2e-16
## day_rescale      0.2889    0.1770 2241.0000    1.63   0.1028
## day_rescale_2    -0.4061    0.1568 2042.0000   -2.59   0.0097
##
## (Intercept)      *
## factor(dayafter_e)1 ***
## day_rescale
## day_rescale_2    **
```



```

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) fc(_)1 dy_rsc
## fctr(dyf_)1 -0.268
## day_rescale -0.867  0.016
## day_rescl_2  0.712  0.075 -0.958

## Is Quadratic effect significant improvement?
mlm_anova<-anova(fit.object2,fit.object1)

## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 0.00961

####Significant?
mlm_anova[2,8]<.1

## [1] TRUE

## Cubic?
fit.object3=lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+day_rescale+
                day_rescale_2+day_rescale_3+
                (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object3)

```

```
## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_c ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 +
## day_rescale_3 + (1 + factor(dayafter_e) + day_rescale | id)
## Data: data_sim_long
##
## REML criterion at convergence: 4671
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.860 -0.580 -0.012  0.600  3.625
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   id       (Intercept)          0.106    0.326
##           factor(dayafter_e)1  0.615    0.784   -0.59
##           day_rescale          0.281    0.530   -0.97  0.37
## Residual                0.315    0.562
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##              Estimate Std. Error      df t value
## (Intercept)   -0.4089    0.0719 2130.0000   -5.69
## factor(dayafter_e)1  0.8708    0.0629  346.0000   13.84
## day_rescale     3.1392    0.5577 2062.0000    5.63
## day_rescale_2   -6.6288    1.1658 2036.0000   -5.69
## day_rescale_3    3.7631    0.6986 2041.0000    5.39
##              Pr(>|t|)
```

```

## (Intercept)          0.000000014 ***
## factor(dayafter_e)1    < 2e-16 ***
## day_rescale           0.000000021 ***
## day_rescale_2         0.000000015 ***
## day_rescale_3         0.000000080 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr) fc(_)1 dy_rsc dy_r_2
## fctr(dyf_)1  0.056
## day_rescale -0.909 -0.263
## day_rescl_2  0.830  0.289 -0.981
## day_rescl_3 -0.777 -0.282  0.949 -0.991

## Is Cubic effect significant improvement?
mlm_anova<-anova(fit.object3,fit.object2)

## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 0.000000078

####Significant?
mlm_anova[2,8]<.1

## [1] TRUE

```

```
## Quartic?
fit.object4=lmer(senseofcontrol_c ~ 1+factor(dayafter_e)+day_rescale+
                day_rescale_2+day_rescale_3+day_rescale_4+
                (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)

## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,
: unable to evaluate scaled gradient

## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,
: Model failed to converge: degenerate Hessian with 1 negative eigenvalues

summary(fit.object4)

## Error in calculation of the Satterthwaite's approximation. The output of
lme4 package is returned

## summary from lme4 is returned
## some computational error has occurred in lmerTest

## Linear mixed model fit by REML ['lmerMod']
## Formula:
## senseofcontrol_c ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 +
##   day_rescale_3 + day_rescale_4 + (1 + factor(dayafter_e) +
##   day_rescale | id)
## Data: data_sim_long
##
## REML criterion at convergence: 4710
##
## Scaled residuals:
##   Min       1Q   Median       3Q      Max
## -3.671 -0.603 -0.018  0.629  4.132
```

```
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   id       (Intercept)         0.0000   0.000
##           factor(dayafter_e)1  0.4488   0.670      NaN
##           day_rescale          0.0131   0.115      NaN -1.00
## Residual                0.3424   0.585
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)      -0.2551    0.1324  -1.93
## factor(dayafter_e)1  0.8952    0.0621  14.42
## day_rescale       1.1442    1.5475   0.74
## day_rescale_2      0.5392    5.2905   0.10
## day_rescale_3     -5.8533    6.9496  -0.84
## day_rescale_4      4.3037    3.0977   1.39
##
## Correlation of Fixed Effects:
##           (Intr) fc(_)1 dy_rsc dy_r_2 dy_r_3
## fctr(dyf_)1  0.336
## day_rescale -0.967 -0.374
## day_rescl_2  0.924  0.345 -0.987
## day_rescl_3 -0.881 -0.312  0.960 -0.992
## day_rescl_4  0.840  0.283 -0.928  0.974 -0.995
## convergence code: 0
## unable to evaluate scaled gradient
## Model failed to converge: degenerate Hessian with 1 negative eigenvalues
## Is Quartic effect significant improvement?
```

```
mlm_anova<-anova(fit.object4,fit.object3)

## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 1

####Significant?
mlm_anova[2,8]<.1

## [1] FALSE

### Estimated Effects by Day, using best fitting model
coef_curv=coef(summary(fit.object3))

(neteffects_group=coef_curv[1,1]+neteffects_calc[,1]*coef_curv[2,1]+
  neteffects_calc[,2]*coef_curv[3,1]+neteffects_calc[,3]*coef_curv[4,1]+
  neteffects_calc[,4]*coef_curv[5,1])

##   day_1   day_2   day_3   day_4   day_5   day_6   day_7   day_8
## -0.1575 -0.0161  0.9086  0.0270 -0.0261 -0.0990 -0.1689 -0.2133
##   day_9  day_10
## -0.2097 -0.1355

#used for plotting
library(taRifx) #sort dataframe by id, then day
```

```
#plotted estimated net effect by day
data_sim_long=sort(data_sim_long, f= ~ id + day )
data_sim_long$neteffects_group[data_sim_long$id==1]=
  as.numeric(as.character(neteffects_group))
```

Grand-Mean Centered

```
## Grand-Mean Centered
## main effects, with random intercepts and slope
mlm <-lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+
          (1+factor(dayafter_e)|id), data=data_sim_long)

## main effects, with random intercepts and no random slope
mlm_nrs <-lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+
              (1|id), data=data_sim_long)

## is random slope, significant improvement?
mlm_anova<-anova(mlm,mlm_nrs)

## refitting model(s) with ML (instead of REML)

## only uses ML for anova
### pvalue
mlm_anova[2,8]

## [1] 1.43e-26

## MLM final model
summary(mlm)
```

```
## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_z ~ 1 + factor(dayafter_e) + (1 + factor(dayafter_e) |
## id)
## Data: data_sim_long
##
## REML criterion at convergence: 5523
##
## Scaled residuals:
## Min      1Q  Median      3Q      Max
## -3.424 -0.577 -0.027  0.592  3.769
##
## Random effects:
## Groups   Name                Variance Std.Dev. Corr
## id       (Intercept)          0.460    0.678
##          factor(dayafter_e)1  0.439    0.662    0.48
## Residual                    0.359    0.599
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)   -0.1017    0.0412 299.0000   -2.47    0.014 *
## factor(dayafter_e)1  1.0018    0.0559 270.9000   17.93 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
```



```
## fctr(dyf_)1 0.240

confint(mlm, method = "Wald")

##                2.5 % 97.5 %
## .sig01          NA      NA
## .sig02          NA      NA
## .sig03          NA      NA
## .sigma          NA      NA
## (Intercept)    -0.182 -0.021
## factor(dayafter_e)1 0.892 1.111

#tests of time variance
fit.object0=lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+
                (1+factor(dayafter_e)|id), data=data_sim_long)

fit.object1=lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+day_rescale+
                (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object1)

## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_z ~ 1 + factor(dayafter_e) + day_rescale + (1 +
## factor(dayafter_e) + day_rescale | id)
## Data: data_sim_long
##
## REML criterion at convergence: 5499
##
## Scaled residuals:
```

```
##      Min      1Q Median      3Q      Max
## -3.538 -0.574 -0.015  0.575  3.365
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##   id       (Intercept)          0.537    0.733
##           factor(dayafter_e)1  0.515    0.718    0.26
##           day_rescale          0.188    0.434   -0.37  0.41
## Residual                0.338    0.582
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    -0.0183    0.0500 297.1000   -0.37  0.7142
## factor(dayafter_e)1  0.9648    0.0585 276.2000   16.50 <2e-16 ***
## day_rescale     -0.1480    0.0490 300.2000   -3.02  0.0028 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr) fc(_)1
## fctr(dyf_)1  0.015
## day_rescale -0.568  0.308
##
## Is linear effect significant improvement?
mlm_anova<-anova(fit.object1,fit.object0)
## refitting model(s) with ML (instead of REML)
### pvalue
```

```
mlm_anova[2,8]

## [1] 0.0000115

####Significant?
mlm_anova[2,8]<.1

## [1] TRUE

## Quadratic?
fit.object2=lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+
                 day_rescale+day_rescale_2+
                 (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object2)

## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_z ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 +
## (1 + factor(dayafter_e) + day_rescale | id)
## Data: data_sim_long
##
## REML criterion at convergence: 5494
##
## Scaled residuals:
##    Min      1Q  Median      3Q     Max
## -3.517 -0.588 -0.018  0.587  3.384
##
## Random effects:
```

```
## Groups Name Variance Std.Dev. Corr
## id (Intercept) 0.536 0.732
## factor(dayafter_e)1 0.515 0.718 0.26
## day_rescale 0.189 0.435 -0.37 0.40
## Residual 0.337 0.581
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
## Estimate Std. Error df t value Pr(>|t|)
## (Intercept) -0.1031 0.0601 595.0000 -1.72 0.087
## factor(dayafter_e)1 0.9533 0.0586 280.0000 16.26 <2e-16
## day_rescale 0.2977 0.1822 1932.0000 1.63 0.102
## day_rescale_2 -0.4123 0.1624 1771.0000 -2.54 0.011
##
## (Intercept) .
## factor(dayafter_e)1 ***
## day_rescale
## day_rescale_2 *
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) fc(_)1 dy_rsc
## fctr(dyf_)1 0.057
## day_rescale -0.662 0.008
## day_rescl_2 0.555 0.077 -0.963

## Is Quadritic effect significant improvement?
mlm_anova<-anova(fit.object2,fit.object1)
```

```
## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 0.0111

####Significant?
mlm_anova[2,8]<.1

## [1] TRUE

## Cubic?
fit.object3=lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+day_rescale+
                 day_rescale_2+day_rescale_3+
                 (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object3)

## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_z ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 +
## day_rescale_3 + (1 + factor(dayafter_e) + day_rescale | id)
## Data: data_sim_long
##
## REML criterion at convergence: 5468
##
## Scaled residuals:
## Min      1Q  Median      3Q      Max
```

```
## -3.622 -0.571 -0.020 0.587 3.290
##
## Random effects:
## Groups Name Variance Std.Dev. Corr
## id (Intercept) 0.537 0.733
## factor(dayafter_e)1 0.521 0.722 0.26
## day_rescale 0.195 0.442 -0.37 0.40
## Residual 0.333 0.577
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
## Estimate Std. Error df t value
## (Intercept) -0.3951 0.0832 1458.0000 -4.75
## factor(dayafter_e)1 0.8601 0.0614 337.0000 14.00
## day_rescale 3.0639 0.5762 1776.0000 5.32
## day_rescale_2 -6.4530 1.2053 1759.0000 -5.35
## day_rescale_3 3.6534 0.7224 1766.0000 5.06
## Pr(>|t|)
## (Intercept) 0.000002254 ***
## factor(dayafter_e)1 < 2e-16 ***
## day_rescale 0.000000118 ***
## day_rescale_2 0.000000097 ***
## day_rescale_3 0.000000469 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) fc(_)1 dy_rsc dy_r_2
## fctr(dyf_)1 0.247
## day_rescale -0.808 -0.282
```

```
## day_rescl_2  0.741  0.307 -0.981
## day_rescl_3 -0.694 -0.300  0.949 -0.991

## Is Cubic effect significant improvement?
mlm_anova<-anova(fit.object3,fit.object2)

## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 0.000000459

####Significant?
mlm_anova[2,8]<.1

## [1] TRUE

## Quartic?
fit.object4=lmer(senseofcontrol_z ~ 1+factor(dayafter_e)+day_rescale+
                day_rescale_2+day_rescale_3+day_rescale_4+
                (1+factor(dayafter_e)+day_rescale|id), data=data_sim_long)
summary(fit.object4)

## Linear mixed model fit by REML t-tests use Satterthwaite
## approximations to degrees of freedom [lmerMod]
## Formula:
## senseofcontrol_z ~ 1 + factor(dayafter_e) + day_rescale + day_rescale_2 +
## day_rescale_3 + day_rescale_4 + (1 + factor(dayafter_e) +
```

```
##      day_rescale | id)
##      Data: data_sim_long
##
## REML criterion at convergence: 5462
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.573 -0.575 -0.021  0.584  3.340
##
## Random effects:
##      Groups   Name                Variance Std.Dev. Corr
##      id       (Intercept)          0.537    0.733
##              factor(dayafter_e)1 0.520    0.721    0.26
##              day_rescale          0.195    0.442   -0.37  0.40
##      Residual                0.333    0.577
## Number of obs: 2535, groups: id, 300
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    -0.2435    0.1386 2019.0000   -1.76    0.079
## factor(dayafter_e)1  0.8838    0.0638  391.0000   13.85 <2e-16
## day_rescale      1.1067    1.5431 1758.0000    0.72    0.473
## day_rescale_2     0.5727    5.2781 1757.0000    0.11    0.914
## day_rescale_3    -5.7803    6.9377 1761.0000   -0.83    0.405
## day_rescale_4     4.2301    3.0940 1765.0000    1.37    0.172
##
## (Intercept)      .
## factor(dayafter_e)1 ***
## day_rescale
```



```

## day_rescale_2
## day_rescale_3
## day_rescale_4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##          (Intr) fc(_)1 dy_rsc dy_r_2 dy_r_3
## fctr(dyf_)1   0.360
## day_rescale -0.923 -0.354
## day_rescl_2   0.880   0.332 -0.987
## day_rescl_3 -0.839 -0.301   0.960 -0.992
## day_rescl_4   0.800   0.272 -0.928   0.974 -0.995

## Is Quartic effect significant improvement?
mlm_anova<-anova(fit.object4,fit.object3)

## refitting model(s) with ML (instead of REML)

### pvalue
mlm_anova[2,8]

## [1] 0.171

####Significant?
mlm_anova[2,8]<.1

## [1] FALSE

### Estimated Effects by Day, using best fitting model

```

```

coef_curv=coef(summary(fit.object3))

(neteffects_grand=coef_curv[1,1]+neteffects_calc[,1]*coef_curv[2,1]+
  neteffects_calc[,2]*coef_curv[3,1]+
  neteffects_calc[,3]*coef_curv[4,1]+
  neteffects_calc[,4]*coef_curv[5,1])

##   day_1   day_2   day_3   day_4   day_5   day_6   day_7   day_8
## -0.1496 -0.0112  0.9020  0.0318 -0.0197 -0.0907 -0.1592 -0.2033
##   day_9   day_10
## -0.2012 -0.1308

library(taRifx) #sort dataframe by id, then day

#plotted estimated net effect by day
data_sim_long=sort(data_sim_long, f= ~ id + day )
data_sim_long$neteffects_grand[data_sim_long$id==1]=
  as.numeric(as.character(neteffects_grand))

```

Spaghetti Plot

```
ggplot(data = data_sim_long[data_sim_long$completed>5,],  
       aes(x = day, y = senseofcontrol, group = id)) +  
  geom_line(data = data_sim_long, alpha=.20, color="dodgerblue4")+  
  geom_smooth(method = "loess", span=.25, aes(group = 1),  
             color="dodgerblue4", fill="dodgerblue4")+  
  theme_min()+xlab("Days since the election") + ylab("Raw Score")
```

```
ggplot(data = data_sim_long[data_sim_long$completed>5,],
       aes(x = day, y = senseofcontrol_c, group = id)) +
  geom_line(data = data_sim_long, alpha=.20, color="dodgerblue4")+
  geom_smooth(method = "loess", span=.25, aes(group = 1),
             color="dodgerblue4", fill="dodgerblue4")+
  geom_point(data = data_sim_long, alpha=1, size=2,
            aes(y=neteffects_group, x=day, group=1), color="black") +
  theme_min()+xlab("Days since the election") + ylab("Group-Mean Centered")
```

Black points indicate estimated net effect by day using best fitting time varying model.

```
ggplot(data = data_sim_long[data_sim_long$completed>5,],
       aes(x = day, y = senseofcontrol_z, group = id)) +
  geom_line(data = data_sim_long,alpha=.20,color="dodgerblue4")+
  geom_smooth(method = "loess",span=.25,aes(group = 1),
             color="dodgerblue4", fill="dodgerblue4")+
  geom_point(data = data_sim_long,alpha=1,size=2,
            aes(y=neteffects_grand,x=day,group=1),color="black") +
  theme_min()+xlab("Days since the election") + ylab("Grand-Mean Centered")
```

Black points indicate estimated net effect by day using best fitting time varying model.